

Bertoni's Mammals: An annotated interpretation of the 1939 *Catálogos Sistemáticos de los Vertebrados del Paraguay*

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ABSTRACT: Arnaldo de Winkelried Bertoni (1878–1973) was the principal student of the Paraguayan fauna during the early 20th Century. The publication widely considered to be his “magnum opus” was the 1939 “*Catálogos Sistemáticos de los Vertebrados del Paraguay*” in which he attempted to provide an annotated list of the species of mammals, birds, fish, reptiles and amphibians known to occur in Paraguay at that point. This article is a modern review of the mammal section of his *Catálogos*. I attempt to identify Bertoni's key bibliographical sources, provide an abbreviated synonymy and update his taxonomy in a modern context, while highlighting the key nomenclatural and taxonomical works that explain the differences. Included is a gazetteer for the geographical locations cited by Bertoni and a complete reference list appropriate for interpreting his work.

KEYWORDS: Arnaldo de Winkelried Bertoni, catalogue, distribution, nomenclature, taxonomy.

INTRODUCTION

Following in the great tradition of Paraguayan-based naturalists begun by Félix de Azara, Arnaldo de Winkelried Bertoni (1878–1973) was the principal student of the national fauna during the early 20th Century (Contreras, 2019). Working under geographical and logistical constraints from his bases at the family estates at Yaguaraspá (= Capitán Meza), Itapúa department (27° 01' S, 55° 34' W) and Puerto Bertoni, Alto Paraná department (25° 39' S, 54° 35' W) and later in the capital Asunción, he frequently attached to his manuscripts a humble recognition of its limitations (Bertoni, 1901). Despite this, critiques of his work often contained patronizing references to his lack of formation and occasionally mild mockery of his results (Lynch-Arribáizaga, 1902; von Ihering, 1904). Though still remembered fondly by biologists in the land where he made his name, the fruits of his labours are only rarely referenced in the scientific literature on account of the dated and often confusing taxonomy employed, the lack of precise details provided in support of records, and what appear to be, at least in hindsight, obvious errors.

The publication widely considered to be his “magnum opus” was the 1939 “*Catálogos Sistemáticos de los Vertebrados del Paraguay*” in which he attempted to provide an annotated list of the species of mammals, birds, fish, reptiles and amphibians known to occur in Paraguay at that time. This updated Bertoni's (1914) earlier “*Catálogos*” with the same intent. So defining a publication was Bertoni (1939), it is by far the most cited of his works. What is often overlooked is that the majority of the ground work for the preparation of the *Catálogos* was published in a series of shorter notes in obscure, local and regional journals that are hard to obtain even in Paraguay. However, these earlier reports provide considerable context that contribute greatly to the utility of the *Catálogos* as a piece of scholarly work.

With a view to re-affirming the enormous contribution that Bertoni made to Paraguayan biology, and to assist in interpreting his perceived “errors” in the context of his time, this paper aims to be a modern interpretation of the mammal section of his *Catálogos Sistemáticos*. My objective here is to identify Bertoni’s key bibliographical sources, provide references to his entire mammalian work, and to update his taxonomy in a modern context, highlighting the key nomenclatural and taxonomic works that explain the differences. I provide a gazetteer for the geographical locations cited by Bertoni and a complete list of references necessary for interpreting his work.

Following in the example set by Bertoni, I humbly recognize my own limitations in this occasionally speculative exercise, but hope that the results will increase the utility of the *Catálogos* to contemporary biologists in Paraguay and beyond, and contribute to a renewed appreciation of the value of Bertoni’s academic input during the early days of Southern Cone zoology.

Bertoni publications dealing specifically with mammals ¹

Bertoni, A. de W., 1904a. Sobre mamíferos útiles y nocivos (costumbres etc.). – *El Agricultor*, 11: 57–58.

Bertoni, A. de W., 1904b. Sobre mamíferos útiles y nocivos (costumbres etc.) continuación. – *El Agricultor*, 12: [page numbers not visible].

A narrative text in two parts, designed for a popular audience discussing the utility of mammals to human endeavour. This was clearly intended as a conservation-themed text with the intention of discouraging persecution of mammals. Paraguay, 1 January 1904.

Bertoni, A. de W., 1910. Materiales para la zoología económica. Animales útiles. – *Revista de Agronomía y Ciencias Aplicadas*, 4: 50–52.

A brief text making mention of certain didelphid species (“*Micoureus pusillus*” and “*Peramys*”) and their propensity for controlling insects. Puerto Bertoni, 20 March 1910.

Bertoni, A. de W., 1914a. Fauna Paraguaya. Catálogos Sistemáticos de los Vertebrados del Paraguay. Peces, batracios, reptiles, aves y mamíferos conocidos hasta 1914 (pp. 1–78). In: Bertoni, M.S. (Ed.) *Descripción Física y Económica del Paraguay*. – M. Brossa, Asunción.

The first edition of his classic catalogue, listing 113 species of mammals for Paraguay. The nomenclature and taxonomy is stated to be correct until “mid 1913”. Puerto Bertoni, July 1913.

Bertoni, A. de W., 1914b. Apéndice a los vertebrados. Adiciones, observaciones, cambios posteriores y correcciones (pp. 79–84). In: Bertoni, M.S. (Ed.) *Descripción Física y Económica del Paraguay*. – M. Brossa, Asunción.

An appendix to the first edition of the catalogue dealing with modifications to the nomenclature. Just three minor spelling corrections were made to the mammal catalogue. Asunción, December 1914.

Bertoni, A. de W., 1914c. Origen e instinto del gato doméstico. – *Revista de Agronomía y Ciencias Aplicadas*, 5: 413.

[not seen]

¹ Bertoni usually dated his publications, as well as the locality at which they were written. This is to be understood as the date that Bertoni wrote (or signed off on) these documents, and not the date that they were published.

Bertoni, A. de W., 1915. Sobre mamíferos útiles y nocivos del Paraguay. – *Anales de Zoología Aplicada (Agrícola, Médica, Veterinaria)*, 1: 31–36.

A text published internationally (in a Chilean journal) that was clearly derived largely from Bertoni (1904a, b). Asunción, April 1914.

Bertoni, A. de W., 1923. Noticias zoológicas Didelfidos de la Bahía de Asunción. – *Revista de la Sociedad Científica del Paraguay*, 1 (4, 5): 51

Reports the presence of five species of opossum in the Bahía de Asunción area with ecological notes. Asunción, 26 May 1923.

Bertoni, A. de W., 1924a. Noticias zoológicas. El *Speothos venaticus* en el Paraguay. – *Revista de la Sociedad Científica del Paraguay*, 1 (6): 93.

First report of the bush dog in Paraguay. The publication was undated by Bertoni.

Bertoni, A. de W., 1924b. Noticias zoológicas. Sobre mamíferos fosiles del Paraguay. – *Revista de la Sociedad Científica del Paraguay*, 1 (6): 93.

A report of fossil remains of large mammals excavated from the Pilcomayo region by C. Rocholl, which Bertoni reports as a glyptodont, and a likely fragment of Megatherium bone. The lack of existing Paraguayan fossil material for study is lamented. The publication was undated by Bertoni.

Bertoni, A. de W., 1925a. Noticias zoológicas. *Conepatus suffocans* Ill. Dyaguaré. – *Revista de la Sociedad Científica del Paraguay*, 2 (1): 68.

Reports the presence of the skunk in Paraguay, and reveals some confusion over the correct nomenclature for the group. The publication was undated by Bertoni.

Bertoni, A. de W., 1925b. Noticias zoológicas. El abinismo en el Aguará–chaí (*Canis brasiliensis* Schinz.). – *Revista de la Sociedad Científica del Paraguay*, 2 (1): 68.

Reports an “albino” crab–eating fox from Asunción. Bertoni expresses the existing confusion over the taxonomy of the group. The publication was undated by Bertoni.

Bertoni, A. de W., 1925c. Noticias zoológicas. *Felis (Catopuma) bracata* Cope. – *Revista de la Sociedad Científica del Paraguay*, 2 (1): 68.

Reports the presence of the pantanal cat in Paraguay based on a specimen obtained by C. Rocholl and purportedly from the Paraguayan Chaco. The publication was undated by Bertoni.

Bertoni, A. de W., 1925d. Noticias zoológicas. El *Toxodon* del Pilcomayo. – *Revista de la Sociedad Científica del Paraguay*, 2 (1): 67.

Further report on fossils from the Pilcomayo collected by C. Rocholl and F. B. Bergmann. A near complete skull of *Toxodon platensis* was deposited at the Jardín Botánico de La Trinidad. The publication was undated by Bertoni.

Bertoni, A. de W., 1928. Noticias paleontológicas. La *Macrauchenia* en el Paraguay. – *Revista de la Sociedad Científica del Paraguay*, 2 (4): 189.

An update on fossils from the Pilcomayo collected by Rocholl and Bergmann, with the statement that the species is probably *Macrauchenia boliviensis*. The publication was undated by Bertoni.

Bertoni, A. de W., 1930. Nuevo gato Paraguayo el *Felis geoffroyi* Orb. – *Revista de la Sociedad Científica del Paraguay*, 2 (6): 258.

Reports the presence in Geoffroy’s cat in Paraguay based on several specimens from the Paraguayan Chaco. Asunción, June 1929.

Bertoni, A. de W., 1931, El gliptodonte del Pilcomayo (*Glyptodon clavipes* Ow.). – *Revista de la Sociedad Científica del Paraguay*, 3 (1): 5.

Reveals that the collection locality for the fossils collected on the Pilcomayo is Reventón, and documents the presence of *Glyptodon clavipes* from Paraguay. The publication was undated by Bertoni.

Bertoni, A. de W., 1932. Sobre mustélidos del Paraguay: Yaguapé (Mamíferos). – *Revista de la Sociedad Científica del Paraguay*, 3 (3): 104–105.

Reports the presence of greater grison in Paraguay and notes the existing confusion over the taxonomy of the group. Asunción, November 1932.

Problems with the *Catálogo Sistemático*

Published on 14 May 1939 and subtitled “*Mamíferos, aves, reptiles, batracios y peces comprobados hasta 1937*” (Mammals, birds, reptiles, batrachians and fish confirmed until 1937), Bertoni’s *Catálogo* was the most complete up-to-date catalogue of Paraguayan vertebrates at that time, updating the nomenclature of previous works and claiming to clarify the identity of certain species described by Azara that, until then, “*permanecían oscuras para las naturalistas*” (had naturalists in the dark as to their true identity). However, despite Bertoni’s stated purpose to correctly document the vertebrate species confirmed as present in Paraguay, the work suffers from several methodological weaknesses that have led subsequent researchers to mention it only briefly and usually in a historic context, or to ignore it entirely. I summarize these issues in the following paragraphs.

Presentation of data – The utility of the catalogue is seriously hampered by a lack of citation of specific specimens (though in many cases they undoubtedly existed), and by a somewhat inconsistent treatment of species. The occasional inclusion of random natural history observations for some species has little relevance to the taxonomic objectives of the work, while more relevant issues, such as the reasons for listing subspecies in some cases and not in others was not explained. Numerous typographical errors occur throughout the document, occasionally even in scientific names, suggesting (perhaps unfairly) a lack of close attention to the material. No explanation is provided for the occasional usage of exclamation marks in the distribution sections and, while these may simply be foibles of Bertoni’s writing style, their occurrence in a scientific context creates difficulties of interpretation. Frustratingly, Bertoni failed to reference his own publications, many of which support his identifications with additional data, but have been largely overlooked.

Geographical Area – The majority of the covered species lack any information other than general geographical descriptions (which are inconsistently applied and occasionally omitted), and a local Guaraní name. Furthermore, the use of the term Alto Paraná (or A. P.) to indicate a species with a “vast distribution from Encarnación to Guayrá” and for which Bertoni “has seen so many specimens that a list of localities would be out of place” is not informative. In modern-day Paraguay both Alto Paraná and Guairá are political departments (with capitals Ciudad del Este and Villarrica, respectively) (see Figure 1) encompassing a comparatively small area of the eastern Oriental region of Paraguay. However, in this context Bertoni is referring to what today are the cities of Encarnación (Itapúa department) and Salto del Guairá (Canindeyú department). Quite apart from the fact that this “vast distribution” actually includes less than a third of the Oriental region, which itself forms less than 40% of the entire national territory; it also refers essentially to the area that was historically covered by the Alto Paraná Atlantic Forests. It does not include comprehensive areas of any of the other major



Figure 1. Map of Paraguay showing the political departments: Chaco region – Alto Paraguay (APY), Boquerón (BOQ), Presidente Hayes (PHA); Oriental region – Amambay (AMA), Alto Paraná (APA), Caaguazú (CAA), Canindeyú (CAN), Caazapá (CAZ), Central (CEN), Concepción (CON), Cordillera (COR), Guairá (GUA), Itapúa (ITA), Misiones (MIS), Ñeembucú (ÑEE), Paraguarí (PAR), San Pedro (SPE).

eco–regions in Paraguay—Chaco, Cerrado, Mesopotamian Grasslands, and Pantanal. Thus, it suggests that Bertoni’s familiarity of the fauna is biased towards a specific geographical area and habitat that covers only a small percentage of Paraguayan territory. This premise is supported by the absence of prevalent and common elements of the Pantanal, Chaco, and Cerrado faunae from his lists and the vagueness of the distribution data for those taxa that are included.

Bertoni’s Evaluation of Records – Bertoni’s (1939) *Catálogo* includes several species that he could not personally vouch for, but that had been reported to him by local people. He distinguished these from “confirmed” species by the non-italicization of the scientific name and described them as species for which “there is doubt of provenance” or which “have not

yet been proved to occur in Paraguay". A modern interpretation of this would be to consider such species as of hypothetical occurrence in Paraguay or pending documentation. However, in contrast to this approach for non-professionals, Bertoni humbly extends the courtesy of accepting species he was not personally familiar with, but which have been published by earlier authors (among them Yepes, von Ihering, Trouessart, and Thomas) even if these sources lacked specific data to support them. Though Bertoni claims in his introduction to have made numerous omissions to the list to "*no apartarme del rigor que exige la zoogeografia*" ("not distance myself from the rigour demanded by zoogeography"), the approach to acceptance of records is applied inconsistently and, at times, is based on the assumed level of expertise of the source. This is perhaps due in no small part to the esteem in which he held his academic colleagues and to the frequently unfair criticism that his own judgement had received previously in the published literature. Nonetheless, this bias represents a departure from what we would today call scientific rigour. Such an approach is further complicated by the absence of a list of references cited, making it difficult to identify the source of these records and, hence, to assess their credibility.

Bertoni unintentionally provided us with additional reasons to be doubtful of the full employment of scientific rigour to his own records. A statement accompanying *Mazama nanus* "*Creo ser esta una especie enana que cacé en Puerto Bertoni*" ("I believe this to be a dwarf species I killed in Puerto Bertoni") suggests a degree of uncertainty that should have resulted in its omission from a list in which scientific criteria are dutifully applied, or at least its designation as hypothetical. While our current understanding of the distribution of this species suggests that Bertoni was likely correct in this instance, the failure to elaborate on why he believed the deer he hunted to be *Mazama nanus*, or even a brief description of it, represents a missed opportunity for the reader to assess the accuracy of the identification and detracts considerably from the utility of the document as a zoogeographical source. This is in stark contrast to the lengthy discussion of the existence of grey individuals of *Tapirus terrestris* that goes so far as to include an opinion regards to the alleged stronger flavour of the animals from the banks of the Paraná River. Such divagations, undoubtedly the result of the lack of formal scientific training, contribute to collective doubt in the minds of researchers who are then required to assess the reliability of species for which the identification is rather more complex and for which Bertoni provided no details.

ANNOTATED LIST

Interpretation of the Annotated List

The following is an annotated translation of the mammal section of Bertoni's Mammal *Catálogo*. A facsimile of the original Spanish text is provided as an appendix. My translations of Bertoni's texts are included within quotation marks (" ") to distinguish translation from my annotations.

I update the species-level taxonomy and include full references for authors of all taxa instead of the abbreviations employed by Bertoni. A brief synonymy (indented) follows to identify the authors of all of the generic, subgeneric, specific, and subspecific names used by Bertoni. The origins of spellings that diverge (either emendations or incorrect subsequent spellings) from the original descriptions are identified with a colon ":" separating the name from the author. These should not be considered complete synonymies for the species. Following the synonymy is a list (without indent) of the name combinations used by Bertoni; these are referenced to the date of each of his publications.

Finally, in the “Comments” for each species I provide taxonomic discussions where appropriate, orient the reader to the nomenclatural issues involved, provide a translation of the indigenous Guaraní name listed by Bertoni (where available), link the species to the descriptions by Félix de Azara (1801, 1802; completing a task that was attempted inconsistently by Bertoni), and provide the bases for my own interpretations of what I consider to be anomalous records. I caution that by the nature of Bertoni’s 1939 publication, these interpretations are necessarily subjective. I make no claims to infallibility, only offering a reasonable explanation based on our current knowledge of the distribution and ecology of the Paraguayan mastofauna and my identification of Bertoni’s probable literature sources based on nomenclatural patterns he employed.

Comment on Bertoni’s Introduction to the Mammal *Catálogo*

The introduction is retained almost word for word from Bertoni (1914a). The major difference being information on Guillermo Foster and an update of the number of species from 109 (actually 113) in 1914 to 123 in 1939.

“FIRST CLASS: MAMMALS”

“After the two fundamental works on the Mammals of Paraguay by Azara² and Rengger³, nothing much else has appeared other than brief lists based on collections of rodents and chiropterans, especially by William Foster, those which were left at the National College having unfortunately been lost. The total number of species listed for the country that I am aware of is 85. Adding the new species to the country fauna that I have discovered and some that I have confirmed, the current list is now 123 species. That is, without including the doubtful species and omitting others just in case. In a list published by me in “Prensa” in 1901 88 species were included; my 1904 paper about mammals (El Agricultor) talks about their biology and utility. Further explorations will no doubt increase the number of rodents, especially in the northern Chaco, and it can be predicted which they might be. Amongst the objects sent to the La Plata Museum, Argentina in 1893 were some small mammals, but if they have been incorrectly catalogued like the reptiles, I clarify here that all were collected on the Paraguayan side of the Paraná River. During my visit to the museum in 1905 I was unable to find them. We will see that in all the classes of higher vertebrates there are some species that do not cross the Paraná River.

This catalogue will, I hope, be useful not only for taxonomy and zoogeography, but also to rectify the numerous errors present in personal collections or written by people unfamiliar with the Paraguayan mammal fauna. The names in Guaraní have undergone few changes due to the influence of Europeans”.

“Order I MARSUPIALS”

“Family Didelphidae”

“Very common where they are not persecuted. Their principal enemies are: *Felis pardalis* [= ocelot, *Leopardus pardalis*] for the larger species and domestic cat [*Felis catus*] for the smaller ones. These latter species are extremely useful (1) the *Marmosas* are insectívoros, the *Peramys* [= *Monodelphis*] hunt mice”.

² 1801, *Essais sur l’Histoire Naturelle des Quadrupèdes de la Province du Paraguay*. 1802, *Apuntamientos para la historia natural de los cuadrúpedos del Paraguay y Rio de la Plata*.

³ 1830, *Naturgeschichte der Saeugethiere von Paraguay*.

"([footnote] 1) See A. de W Bertoni: "Mamíferos útiles y nocivos" in "El Agricultor" Numbers 11 and 12 (Asunción 1904) and "Revista de Agronomía" volume 4 Numbers 3 and 4 (1910)".

"1 *Chironectes minimus* (Zimm.)".

"Guaraní: Ihapó. Yaguarasapá, Paraguay (February 1888)! Known only from southern Brazil to Guatemala (Dr. M. S. Bertoni collector) Yguasú (Argentina); Asunción; Puerto Bertoni".

ID = WATER OPOSSUM *Chironectes minimus* (Zimmerman, 1780)

Latra (minima) maculata Zimmermann, 1780: 317

Chironectes Illiger, 1811: 76

Chironectes minimus (1914a; 1923)

Comments: Presumably, the specimen from Yaguarasapá (= Capitán Meza) was collected in February 1888 by Dr Moises Santiago Bertoni, Winkelried's father. Bertoni (1923: 51) referred to the collection locality for this specimen as Pirayú-ih (= Arroyo Pirayú'i), stating that it was collected by day, and "defended itself ferociously". He added that he also examined a skin said to be taken at the Bahía de Asunción, Central department, in 1921. The meaning of the Guaraní name *Ihapó* is unclear, but two possible derivations are water animal with hands (from *y ha po* – water and hands) or water roots (from *y* and *hapo* – water root) in possible reference to nest sites.

"2 *Didelphis paraguayensis* (Oken)".

"Guaraní: Mbihkurê. Paraguay central and southern Misiones lowlands (Argentina.), southern Brazil. Does not reach the Paraná, at least in the forested zones".

ID = WHITE-EARED OPOSSUM *Didelphis albiventris* (Lund, 1840a) (Figure 2)

Didelphis Linnaeus, 1758: 54

Did[elphys]. paraguayensis Oken, 1816: 1147

Didelphis albiventris Lund, 1840a: 18

Didelphys marsupialis var. *azarae* Thomas, 1888a: 328

Didelphis marsupialis azarae (1914a)

Didelphis Azarae (1904b; 1915; 1923)

Comments: This is the *Micuré* of Azara (1802, 1: 209) (Voss *et al.*, 2009). *Didelphis paraguayensis* Oken, 1816 is based on Azara's (1801) *Micouré premier ou micouré proprement dit*. In 1902, J.A. Allen validated the usage of this name, but many Oken names were subsequently declared invalid (Hershkovitz, 1949; IZCN, 1956) making *Didelphis albiventris* Lund, 1840a, the next available name. The Guaraní name *Mbihkurê* means opossum.

Bertoni (1923: 51) noted that he had been unable to find this species in the "eastern forests" (Alto Paraná), but the species is found throughout this region today, perhaps as the result of expansion due to deforestation (Smith, 2007; Owen & Smith, 2019). He noted finding specimens of the "phase described by Azara" and the "pure white-based phase" (for which he used the name *albiventris*) in Asunción, Central department, during 1923. In doing so he confirmed that his usage of the name *D. azarae* was in reference to this species, *sensu* Thomas (1888a) and not *sensu* Temminck (1824) (= *D. aurita*; Hershkovitz, 1969). The type of *D. azarae* is in fact a *D. aurita*, but regardless, Cerqueira & Tribe (2008) and Voss *et al.*, (2009) recommended the suppression of the name *D. azarae* in the interests of stability.



Figure 2. White-eared Opossum *Didelphis albiventris*, Estancia Nueva Gambach, Itapúa department. (Photo: Paul Smith).

“3 *Didelphis marsupialis cancrivora* (Gm.)”.

“Mbikurê, Mbikurê hû. The commonest species in the Alto Paraná forests, with all forms represented except *D. koseritzi* (von Ihering, 1892). The most notable case was a female from Puerto Bertoni (8 October 1896) with colouration of the variation *typica* that was carrying 12 young, 6 with white bristles and 6 black, demonstrating that colour alone has no taxonomic value. All black individuals exist, but the stripes on the face are always notable”.

ID = SOUTHERN BLACK-EARED OPOSSUM *Didelphis aurita* Wied-Neuwied, 1826

Didelphis Linnaeus, 1758: 54

[*Didelphis*] *marsupialis* Linnaeus, 1758: 54

[*Didelphis*] *cancrivora* J.F. Gmelin, 1788: 108

D[idelphis]. aurita Wied-Neuwied, 1826: 395

Didelphis Koseritzi H. von Ihering, 1892: 99

Didelphis marsupialis cancrivora (1914a)

D[idelphis]. cancrivorus (1915)

D[idelphis]. aurita (1923)

D[idelphis]. cancrivora (1904b; 1923)

Comments: *Didelphis cancrivora* Gmelin, 1788, was based on the *le Crabier* of Buffon (1776) with type locality Cayenne and thus correctly applies to the northern South American

species *Didelphis marsupialis* Linnaeus, 1758. The first use of the name *Didelphis cancrivora* for southern populations (now known as *D. aurita*) was by Wagner (1843b: 41), but this application was invalid. The Guaraní name *Mbihkurê hû* means black opossum.

Von Ihering (1892) differentiated *Didelphis koseritzi* from *D. aurita* by the lack of stripes on the head and other differences in pelage colour. Von Ihering (1892: 99) lamented the lack of a skull to confirm its distinctiveness, but added that he was “convinced it would be different”. It is a variant of *D. aurita*.

Bertoni (1923) stated that the description of *D. marsupialis* by Linnaeus corresponded well to the North American species (now known as *D. virginiana*) and that he saw no reason for that name to be applied to South American populations. However, this contradicts the nomenclature employed in both editions of the *Catálogos* and current usage.

“4 *Marmosa grisea* (Desm.)”.

“Anguyá-guaikí. Pirá-yuí (October 1887, Museo de La Plata, Dr. Bertoni leg.), Paraguay central, San Ignacio”.

ID = WOOLLY MOUSE OPOSSUM *Marmosa* subgenus *Micoureus* sp.

Didelphis Linnaeus, 1758: 54

[*Didelphis*] *murina* Linnaeus, 1758: 55

Marmosa J.E. Gray, 1821: 308

Didelphis grisea A.G. Desmarest, 1827: 393

Micoureus Lesson, 1842: 186

Didelphis murina (1904b)

Marmosa grisea (1914a)

Marmosa murina (1915)

Comments: Desmarest (1827) described *Didelphis grisea* based on the *Micouré quatrième, ou Micouré à queue longue* of Azara (1801), but two older names, the invalid *Didelphys marmota* Oken, 1816 (Herskovitz, 1949; IZCN, 1956) and *Didelphys macrura* Olfers, 1818, were also based on the same description. The obscurity of Olfers work meant that that name was long overlooked, explaining Bertoni’s usage (Herskovitz, 1959a, Voss *et al.*, 2009). Azara’s (1801) description is non-diagnostic and has subsequently been applied to a variety of different species, leading Voss *et al.*, (2009) to designated a neotype for *Thylamys macrurus* to fix and conserve usage. The Guaraní name *Anguyá-guaikí* means mouse opossum, the word *guaikí* being attributed to didelphid species with bold markings or rings around the eyes.

Based on the localities provided by Bertoni (1939), it seems highly unlikely that he was referring to *Thylamys macrurus* with this name, as Bertoni (1923) had previously described that species accurately under the name *Marmosa elegans*. Two other mouse opossums with greyish pelage occur in eastern Paraguay, both in the subgenus *Micoureus* (*Marmosa rapposa* Thomas, 1899 and *M. paraguayana* Tate, 1931) (Smith & Owen, 2015), and neither of these is conclusively referred to in the *Catálogos*. Lima-Silva *et al.*, (2019) recently attributed all Paraguayan specimens previously called *M. constantiae* (de la Sancha *et al.*, 2012, Smith & Owen, 2015,) to *M. budini* Thomas, 1920b, but Voss *et al.*, (2020) and Voss (2022) confirmed that these are properly referred to *M. rapposa*.

Marmosa paraguayana dominates in the Atlantic Forest region (which includes Arroyo Pirayu’i, Capitán Meza), but *M. rapposa* in the Paraguay River Basin (which could include

San Ignacio, Misiones department; Smith & Owen, 2015). The specimen sent to the MLP by Bertoni is now lost, so there is no way to conclusively confirm the identity, but it seems probable that it was a *Marmosa* of the subgenus *Micoureus* (*sensu* Voss *et al.*, 2014). The reference to *Marmosa murina* in Bertoni (1915) also surely refers to one of these two species, possibly *M. paraguayana* with which Bertoni would more likely be familiar with from his bases in the Atlantic Forest region.

“5 *Marmosa pusilla* (Desm.)”.

“Anguyá–guaikí. Puerto Bertoni, Paraguay Central, Brazil. The reddish–brown variety *agilis* (Burm.) is common on the banks of the Paraná; the typical form is grey”.

ID = Composite including at least AGILE GRACILE OPOSSUM *Gracilinanus agilis* (Burmeister, 1854) and CHACO MOUSE OPOSSUM *Cryptonanus chacoensis* (Tate, 1831) (Figure 3)

Didelphis Linnaeus, 1758: 54

didelphis pusilla A.G. Desmarest, 1804: 19

Marmosa J.E. Gray, 1821: 308

Didelphys agilis Burmeister, 1854: 139

Micoureus Lesson, 1842: 186

Marmosa agilis chacoensis Tate, 1931: 10

Gracilinanus Gardner & Creighton, 1989: 4

Cryptonanus Voss *et al.*, 2005: 5

Didelphis pusilla (1904b)

Micoureus pusillus (1910)

Marmosa pusilla (1914a; 1915)

Comments: *Didelphis pusilla* Desmarest, 1804 is based on *Micouré sixième, ou micouré nain* of Azara (1801), which corresponds to the *Enano* of Azara (1802, 1: 262), however, Desmarest did not provide a type locality. Azara (1801) stated in his text that his specimens were given to him by Indians of San Ignacio Guazú, and that they had caught them in their houses, leading Tate (1933) to designate San Ignacio Guazú as the type locality. *Thylamys pusillus*, as currently understood, is a Chaco endemic, and San Ignacio Guazú is in the Oriental region of Paraguay where this species does not occur. Recognising the inconsistency, Voss *et al.*, (2009) designated a neotype for *Thylamys pusillus* (MVZ 144311) from near the Trans–Chaco highway 460 km NW of Villa Hayes in Departamento Boquerón, Paraguay, collected on 7 April 1973 by Philip Myers.

Bertoni (1939) is clearly referring to a different species as all of the localities he provided are in eastern Paraguay. Thomas (1900b) applied *Marmosa pusilla* (Desmarest) to the species today known as *Gracilinanus agilis* (Burmeister, 1854) and that species implicitly forms part of Bertoni’s composite as the “reddish–brown variety *agilis* (Burm.)”. However, Bertoni was writing long before the discovery of the cryptic and sympatric genus *Cryptonanus* Voss *et al.*, 2005, of which the abundant species *C. chacoensis* (Tate, 1931) can be distinguished from *agilis* principally on minor cranial characteristics (Voss *et al.*, 2005). The two species occur in sympatry, but *C. chacoensis* appears to be more widespread than *G. agilis* in Paraguay, with *agilis* most frequent in the Cerrado zone (Smith, 2009). It is worthy of note that the distribution of “Paraguay Central” is a term frequently employed by Bertoni throughout his catalogue when referring to the collections of William Foster who collected out of Sapucay, Paraguari department. The type specimen of *Marmosa agilis chacoensis* Tate, 1931, was collected by Foster at Sapucay



Figure 3. Chaco Mouse Opossum *Cryptonanus chacoensis*, Rancho Laguna Blanca, San Pedro department. (Photo: Paul Smith).

(NHM 4.1.5.48; 11 September 1903). It appears that Bertoni's concept of *M. pusilla* included both of these species.

As both *G. agilis* and *C. chacoensis* have reddish pelage, the "typical" grey form seems likely to be in reference to Azara's (1801; 1802) description, which gives the pelage of his "Enano" as aplomado (lead-coloured). Consequently, *M. pusilla sensu* Bertoni seems to be a composite that probably contains at least two different species, but definitely does not contain *Thylamys pusillus* (Desmarest, 1804).

"6 *Marmosa elegans* (Wath.)".

"Asunción. Examination of the cranium and the incrassation of the tail refer the specimens to this southern species. Anguya-guaíki".

ID = LONG-TAILED FAT-TAILED OPOSSUM *Thylamys macrurus* (Olfers, 1818)

D[idelphys]. macrura Olfers, 1818: 205

Marmosa J.E. Gray, 1821: 308

Didelphis elegans G.R. Waterhouse, 1839: 95

Thylamys J.E. Gray, 1843b: 101

Marmosa elegans (1923)

Comments: This is the *Colilargo* of Azara (1802, 1: 251; see Voss *et al.*, 2009). *Didelphys macrura* Olfers, 1818 is based on de Azara's (1801, 1: 290) *Micouré quatrième, ou Micouré à queue longue* with restricted type locality Tapuá, departamento Presidente Hayes, Paraguay (Gardner, 2005). However, *T. macrurus* does not occur west of the Paraguay river and Voss *et al.*, (2009) clarified that the correct type locality was Tapúa (note spelling), Central department, on the eastern bank of the Paraguay River. Voss *et al.*, (2009) designated a neotype (UMMZ 125243) from 28 km SW Pedro Juan Caballero in Amambay department, Paraguay, to eliminate geographic and nomenclatural confusion.

Bertoni (1923: 51) mentioned three individuals of this species entering his room in Asunción during June, July, and October 1920. Although he stated that he did not possess the literature "... *para este clase de averiguaciones, el color y la cola incomparablemente mas gruesa que en su congéneres no me dejan duda*" ("... for this kind of investigation, the colour and tail incomparably thicker than in its congeners leave me in no doubt") of the identification. He noted that a female left three young in a nest in November under a pile of paper. In the *Catálogos*, however, he did not mention colour and stated that examination of the skull and tail incrassation confirmed the identity of a specimen from "Asunción" (presumably the same material) as *Marmosa elegans* (Waterhouse, 1839).

Thylamys elegans (Waterhouse, 1839), as currently defined, is endemic to Chile (Creighton & Gardner, 2008). *Marmosa elegans* has undergone a series of redefinitions since the time of Bertoni, resulting in the splitting into several species, none of which are distributed in Paraguay (Creighton & Gardner, 2008). However, the description, number of mammae, and measurements provided in Bertoni (1923) are consistent with *Thylamys macrurus* (Olfers, 1818), but are not consistent with any other Paraguayan species. Interestingly, only recently has slight tail incrassation been reported in *T. macrurus* (Carmignotto & Monfort, 2006).

"7 *Lutreolina crassicaudata* (Dem.)."

"Mbihkuré-pihtá. Argentina, Paraguay, southern Brazil, Guyana, Asunción"

ID = THICK-TAILED OPOSSUM *Lutreolina crassicaudata* (A.G. Desmarest, 1804)

Didelphis Linnaeus, 1758: 54

didelphis crassicaudata A.G. Desmarest, 1804: 19

Metachirus Burmeister, 1854: 135

Lutreolina Thomas, 1910: 247

D[idelphis]. crassicaudata (1904b)

Metachirus crassicaudata (1914a; 1923)

Comments: This is the *Coligrueso* of Azara (1802, 1: 229; see Voss *et al.*, 2009). *Didelphis crassicaudata* Desmarest, 1804 is based on the *Micouré troisième, ou Micouré à grosse queue* of Azara (1801). Cabrera (1958) restricted the type locality to Asunción. The Guaraní name *Mbihkuré-pihtá* means red opossum.

In an addendum on p. 59, Bertoni stated that the genus *Metachirus* should be used here instead of *Lutreolina*, noting that this should hold even in the case that the "dismembered" genus *Lutreolina* is approved. Thomas (1910:247) described the genus *Lutreolina* solely for this species noting that "many peculiarities, external and cranial, amply entitle it to that distinction". Until that point the species had been often included in *Metachirus* (Lahille, 1899) or *Didelphis* (Thomas, 1888a).

Bertoni (1923) provided a description of the juvenile, likening it to his *Marmosa pusilla* on account of dark markings around the eyes, and cited two specimens in the collection of Sr. C. Rocholl collected in Bahía de Asunción.

“8 *Lutreolina nudicaudata* (Geoff.)”.

“Guaikí. Puerto Bertoni Paraguay! It was known only from Costa Rica to Brazil. Asunción (1921)”.

ID = BROWN FOUR-EYED OPOSSUM *Metachirus myosuros* (Temminck, 1824)

Didelphis nudicaudata É. Geoffroy St-Hilaire, 1803: 142

Didelphis myosuros Temminck, 1824: 38

Metachirus Burmeister, 1854: 135

Lutreolina Thomas, 1910: 247

Metachirus nudicaudata (1914a)

Comments: The text of Bertoni (1939) reads like a first record from Paraguay, but it is identical to that of Bertoni (1914a). The addition of Asunción (1921) as a further locality postdates the original record, but the species was not mentioned in Bertoni (1923), despite the supposed record being earlier and no records with that date being mentioned in that publication. I consider it best to treat the Asunción record of this species as doubtful. Voss (2022) confirmed that Paraguayan specimens previously attributed to *Metachirus nudicaudatus* are properly named *M. myosuros* (Temminck, 1824) by Voss *et al.*, (2019).

“9 *Metachirops opossum* (L.), forma *quica* (Temm.)”.

“Guaikí. Alto Paraná; Asunción. Common in all of the Alto Paraná forests. Colour *always* grey”.

ID = Composite of GREY FOUR-EYED OPOSSUMS *Philander quica* (Temminck, 1824) and *Philander canus* (Osgood, 1913)

[*Didelphis*] *Opossum* Linnaeus, 1758: 55

Philander Brisson, 1762: 13

Didelphis quica Temminck, 1824: 36

Metachirus Burmeister, 1854: 135

Metachirus canus Osgood, 1913: 96

Metachirops Matschie, 1916: 262

Metachirus opossum (1914; 1915)

Metachirus opossum quica (1923)

Comments: The taxonomy of the genus *Philander* Brisson, 1762 continues unresolved and several cryptic species probably remain to be described (Voss *et al.*, 2018; Voss & Giarla, 2020; Voss & Jansa, 2021). In Bertoni’s time it was widely believed that a single widespread grey four-eyed opossum *P. opossum* (Linnaeus, 1758) occurred almost throughout the Neotropics. As late as Hershkovitz (1997) just two species were recognized in the genus *Philander*, though earlier Patton & da Silva (1997) had proposed four, including species status for the Atlantic Forest form for which they used the name *P. frenata* (Olfers, 1818). However, this form was then relegated to subspecies status by Castro-Arellano *et al.* (2000) before being elevated again by Chemisquy & Flores (2012). The genus is now known to contain at least eight morphologically very similar species (Voss & Jansa, 2021).

Two species of *Philander* are now known to occur in Paraguay, one in the Atlantic Forest, and a second distributed along both banks of the Paraguay River, traditionally attributed to *P. opossum canus* (de la Sancha & D'Elía, 2015). Voss *et al.*, (2018) demonstrated that the Atlantic Forest species represents *P. quica* (Temminck, 1824), as the holotype of *P. frenatus* was collected in Amazonia, and they raised *P. canus* (Osgood, 1913) to species level.

The distribution listed by Bertoni confirms that both species were included in his *P. opossum*. The “Alto Paraná forests” refers to the Atlantic Forest region of eastern Paraguay that is inhabited by *P. quica*, and Asunción is in the Paraguay River watershed where *P. canus* occurs. To date there is no evidence of sympatry between the two species. Bertoni (1923) described the specimen from the Bahía de Asunción as being “of the form with a grey dorsum and more or less whitish venter (*quica* Temm.)”. However, *P. quica* and *P. canus* cannot be distinguished externally by pelage colour, and differ only in minor dental characteristics (Voss *et al.*, 2018).

Comments on Bertoni's treatment of *Peramys* (10–13): The genus *Peramys* Lesson, 1842, is a junior synonym of *Monodelphis* Burnett, 1830. Today three species of *Monodelphis* are recognised as occurring in Paraguay, *M. domestica* (Wagner, 1842), *M. dimidiata* (Wagner, 1847) and *M. kunsii* Pine, 1975 (unknown to science at the time of Bertoni). All three are morphologically quite distinct from each other and easily distinguished by external morphology. In Paraguay, *M. domestica* and *M. kunsii* are broadly associated with the Cerrado and Chaco biomes and *M. dimidiata* with the Atlantic Forest (de la Sancha *et al.*, 2007; Smith, 2008a, b, c; Vilela *et al.*, 2010; Smith *et al.*, 2012), though *M. domestica* also occurs at least marginally in Atlantic Forest habitats.

The nomenclature of the red-sided *Monodelphis* that inhabits eastern Paraguay is unstable, and has been complicated by poorly-understood ontogenic and sexually dimorphic colour changes throughout the short lives of these opossums. Until recently the Atlantic Forest form in Paraguay was known as *M. sorex* (Hensel, 1872a), with the yellower Pampean form of Argentina taking the name *M. dimidiata* (Wagner, 1847). This is the *Colicorto* of Azara (1802, 1: 258; see Voss *et al.*, 2009).

Solari (2010) found that *M. sorex* and *M. dimidiata* clustered together in his cytochrome *b* analysis and suggested that, despite ecological differences, they may be conspecific. Vilela *et al.*, (2010) also concluded that *M. sorex* was a subjective junior synonym of *M. dimidiata*, a position further supported by Pavan *et al.* (2014). Concluding that a single reddish species occurred in Azara's (1801; 1802) region of influence, de la Sancha & D'Elía (2015) resurrected the older name *M. brevicaudis* (Olfers, 1818: 205) for that species (see below), but this was based in part on the assumption that the collector, Blas Nosedá, who was the parish priest at San Ignacio Guazú, Misiones department, must have collected the specimen at that locality. Whilst this may be a reasonable supposition, the original text does not, in fact, clarify the collection locality.

Of Bertoni's species, three—*sorex*, *dimidiata* and *henseli*—were listed as occurring in Puerto Bertoni within the Atlantic Forest; and the only species known to occur in this region is *M. dimidiata*. A pale, adult male *M. dimidiata* from 12 km west of Ciudad del Este, Alto Paraná department, Paraguay, had been previously misidentified as *M. scalops* (Thomas, 1888b: 158) by Contreras & Silveira Avalos (1995), and there is no evidence to suggest that other species might occur at this locality.

I reject the usage of *M. brevicaudis* Olfers, 1818 for the species here identified as *M. dimidiata* (Wagner, 1847), noting that in addition to the Code compliant (preamble) objections presented by Voss *et al.*, (2009), the name creates unnecessary confusion with *M. brevicaudata* Erxleben, 1777: 80. I agree with the sentiment expressed by Voss *et al.*, (2009: 415) that: "... the names *sorex* and *dimidiata* are now widely used, and no biological purpose would be served by replacing either with *brevicaudis*" and that the name should be submitted to the Commission for a ruling under plenary powers to conserve usage of *Monodelphis dimidata* (Wagner, 1847) as recommended by Vilela *et al.*, (2010).

"10 *Peramys sorex* (Hensel)".
"Puerto Bertoni".

ID = RED-SIDED SHORT-TAILED OPOSSUM *Monodelphis dimidata* (Wagner, 1847)

Monodelphis Burnett, 1830: 351
Peramys Lesson, 1842: 187
D[idelphys]. dimidiata Wagner, 1847: 151
Microdelphys sorex Hensel, 1872a: 122

Comments: The description of *M. sorex* was based on young individuals, which are notably darker and more chestnut in colouration than adults (Ávila-Pires, 1994; Pine & Handley, 2008). Consequently, many specimens of young *M. dimidata* have been consistently identified as this taxon in the literature (Pine & Handley, 2008).

"11 *Peramys dimidiatus* (Wagn.)".

"Puerto Bertoni. The colouration is stronger than that of specimens from temperate regions, but the skeleton leaves no doubt that it is this species".

ID = RED-SIDED SHORT-TAILED OPOSSUM *Monodelphis dimidata* (Wagner, 1847)

Monodelphis Burnett, 1830: 351
Peramys Lesson, 1842: 187
D[idelphys]. dimidiata Wagner, 1847: 151

Comments: Old adult males of the reddish *Monodelphis* inhabiting the Paraguayan Atlantic Forest are quite pale and yellowish and have been identified as *M. dimidiata* even when *M. sorex* was recognized as a distinct species.

"12 *Peramys brevicaudatus* (Erxl.)".

"Mbikurê-i. Paraguay central, Pirayuí – Alto Paraná. I have observed this species and its relatives hunting rats that are larger than themselves. The *P. dimidiatus* (Wagn.) of southern Brazil and Uruguay is not Azara's "Colicorto" as Sr. Lahille thinks. Nor is a Paraguayan specimen that exists in the Museo de La Plata (X.1888, Dr. Bertoni leg.) referable to *P. dimidiatus*. However, I have confirmed its presence in Puerto Bertoni".

ID = RED-SIDED SHORT-TAILED OPOSSUM *Monodelphis dimidata* (Wagner, 1847)

[*Didelphis*] *brevicaudata* Erxleben, 1777: 80
Monodelphis Burnett, 1830: 351
Peramys Lesson, 1842: 187
D[idelphys]. dimidiata Wagner, 1847: 151
Peramys brevicaudatus (1914a)

Comments: From the description of the pelage colour of *Colicorto* (Azara, 1802, 1: 258; see Voss *et al.*, 2009), it is clear that the description, in fact, does refer to *M. dimidiata* as Lahille (1899) stated. Indeed, confusion over species limits in this group has persisted in the literature until recently. The Guaraní name *Mbihkurê-i* means little opossum.

Bertoni's (1939) usage of *Monodelphis brevicaudatus* (Erxleben, 1777) is easily confused with *M. brevicaudis* (Olfers, 1818), and has been repeated by modern authors such as Chebez (1996), a demonstration of why the proposal to validate the long unused latter name by de la Sancha & D'Elia (2015) runs counter to the basic principle of the Code to promote stability.

"13 *Peramys henseli* Thos".

"Puerto Bertoni, Paraguay! This species must also exist on the Argentine and east banks of the Paraná River. One specimen was identified by Dr. von Ihering (Ex. coll. Bertoni); Entre Rios (Argentina); Rio Grande do Sul – Brazil".

ID = RED-SIDED SHORT-TAILED OPOSSUM *Monodelphis dimidata* (Wagner, 1847)

Monodelphis Burnett, 1830: 351

Peramys Lesson, 1842: 187

D[idelphys]. dimidiata Wagner, 1847: 151

Didelphys (Peramys) Henseli Thomas, 1888b: 159

Peramys henseli (1914a)

Comments: The type is an adult female from Rio Grande do Sul, collected by H. von Ihering at Taquara, the same locality as the type of *M. sorex* (Ávila-Pires, 1994). According to Pine & Handley (2008), the name *M. henseli* has often been applied to pale adult female and half-grown males of *M. dimidiata*.

"14 *Philander lanigera* (Desm.)".

"Paraguay to southern Mexico. In Alto Paraná I have only noted it for the interior of Puerto Bertoni; Iguazú – República Argentina".

ID = BROWN-EARED WOOLLY OPOSSUM *Caluromys lanatus* (Olfers, 1818)

Philander Beckman, 1772: 32, not *Philander* Brisson, 1762: 13

D[idelphys]. lanata Olfers, 1818: 206

didelphis lanigera A.G. Desmarest, 1821: 258

Caluromys J.A. Allen, 1900a: 189

Philander lanigera (1914a)

Comments: This is the *Lanoso* of Azara (1802, 1: 221; also see Voss *et al.*, 2009). *Didelphis lanata* Illiger, 1815: 107, is a *nomen nudum*. *Didelphis lanata* Olfers, 1818, is the correct name, which was based on "*Micouré second ou micouré laineux*" of Azara (1801, 1: 175, misprint for 275), with restricted type locality Caazapá, Paraguay (Cabrera, 1916). This locality was mentioned in the French translation of Azara (1801), but omitted from the Spanish version (Azara, 1802), and both agree that the specimen was in the possession of Don García Francia. The rediscovered type specimen, collected by Azara, was identified as MNCN-M2630 (Museo Nacional de Ciencias Naturales, Madrid) (Voss *et al.*, 2009).

The genus *Philander* is masculine, and Bertoni's use of the feminine epithet *lanigera* (following Desmarest) is in error. The correct application is *Philander laniger*, as used by Cabrera (1916). The misapplication of *Philander* by Bertoni (1914a, 1939) despite J.A.

Allen's (1900a) explanation for adopting of *Caluromys* for this group, further reflects Bertoni's out-of-date understanding of the taxonomy of Paraguayan didelphids.

"Order II EDENTATES"

"Family Bradypodidae"

"15 *Bradypus tridactylus* L."

"Ao-Aó. San Pedro – Misiones, Argentina. Chaco Weyenbergh (in R. Napp, 1876) (Die Argentinische republik, La République argentine, La República Argentina or The Argentine Republic); Oran. In Misiones its distribution doesn't come close to the banks of the Paraná. The species encircles Paraguay almost completely and I have heard word of it from the yerba plantations of the north; but it needs to be confirmed with authentic Paraguayan specimens, and it may yet prove to be another species that occurs there".

ID = BROWN-THROATED SLOTH *Bradypus variegatus* Schinz, 1825

Bradypus Linnaeus, 1758: 34

[*Bradypus*] *tridactylus* Linnaeus, 1758: 34

Brad[ypus]. variegatus Schinz, 1825: 510

Bradypus tridactylus (1914a)

Comments: The Dutch palaeontologist Hendrik Weyenbergh (1842–1885) wrote the faunal chapter in Richard Napp's (1876a, b, c, d) tome, which was written first in German as *Die Argentinische republik* (p. 150–190), but published simultaneously in French as *La République argentine* (p. 125–163), in Spanish as *La República Argentina* (p. 137–174) and English as *The Argentine Republic* (p. 137–174). It is impossible to know to which version Bertoni was referring to, but despite his claim of an Argentine distribution, I was unable to find any mention of the species in any version.

The only original citations referring to the species in Misiones, Argentina, are by Bertoni (1914a) from San Pedro that lack any additional details, and Holmberg (1895), who claimed to have seen skins (Smith & Ríos, 2018). Superina *et al.*, (2010: 124) state that the species is "historically absent from ... northeastern Argentina" and that the southernmost confirmed record of the species in Brazil is from Londrina, Paraná state, where it is now considered extinct. Holmberg (1895) also stated that the species had been included in the Argentine fauna from "Chaco Salteño" (Chaco of Salta) in 1878, in reference to his own earlier publication (Holmberg, 1878: 46) where he gave "Orán" as a locality for a sloth that "he had been induced to believe (*me ha inducido a creer*)" was this species and "according to my inquiries exists in Oran (*segun mis averiguaciones existe en Oran*)". It seems that Bertoni did not see the original source he cited and apparently confused Weyenbergh (1876) with Holmberg (1878).

Bertoni noted hearsay reports of the species in the "*yerbales del norte*" ("yerba mate plantations of the north")—in reference to the northern Oriental region—raising the possibility of confusion between science and local legend. The common name used by Bertoni, *Ao-aó*, is also the name of a legendary beast in the Guaraní folklore. One of the seven offspring of Taú and Keraná, it is said to roam in herds and to have fur like sheep's wool, long claws, and a bear's head. Though said to be a malevolent beast, its description recalls the now extinct ground sloths that once inhabited the region. Irrespective of the reliability of undocumented local reports, there remains no evidence that the species does, or ever has occurred in Paraguay (Smith, 2012; Smith & Ríos, 2018).

The use of the name *B. tridactylus* reflects a common tendency in the earlier literature to confuse this species with *B. variegatus*. In fact, *B. tridactylus* is confined to northeast South America. The only bradypodid with a distribution that comes close to Paraguay is *B. variegatus* (Hayssen, 2009).

“Family Myrmecophagidae”

“16 *Myrmecophaga tridactyla* L”.

“Yurumí, Tamanduá guasú. Though rare, it still in exists in all of the forests of eastern Paraguay and highland Misiones, Argentina”.

ID = GIANT ANTEATER *Myrmecophaga tridactyla* Linnaeus, 1758 (Figure 4)

Myrmecophaga Linnaeus, 1758: 35

[*Myrmecophaga*] *tridactyla* Linnaeus, 1758: 35

[*Myrmecophaga*] *jubata* Linnaeus, 1766: 52

Myrmecophaga (1904b; 1915)

Myrmecophaga jubata (1914a)



Figure 4. Giant Anteater *Myrmecophaga tridactyla*, Estación Tres Gigantes, Alto Paraguay department. (Photo: Paul Smith).

Comments: This is the *Ñurumi* or *Yoquí* of Azara (1802, 1: 66) and *le Gnouroumi* of Azara (1801, 1: 89). The Guaraní name *Yurumí* means “little mouth”. The scientific name *M. jubata* Linnaeus, 1766, was long used for the species, but is antedated by *M. tridactyla* Linnaeus, 1758 (Thomas, 1901f). Rehn (1900) had argued that *M. jubata* was valid, because *M. tridactyla* was based on a composite description.

Though the giant anteater has disappeared from most of its former range in eastern Paraguay, Bertoni’s unfamiliarity with the fauna of the Chaco is illustrated by his failure to include the occidental region in the species distribution, where it is still frequently encountered (Smith & Ríos, 2018).

“17 *Tamandua tetradactyla* (L.)”.

“Kaguaré. More frequent than the previous species in Paraguay and Misiones – Argentina; Puerto Bertoni – Paraguay; Santa Ana – Misiones, Argentina”.

ID = SOUTHERN TAMANDUA *Tamandua tetradactyla* (Linnaeus, 1758)

Tamandua J.E. Gray, 1825b: 343

[*Myrmecophaga*] *tetradactyla* Linnaeus, 1758: 35

Tamandua (1904b; 1915)

Tamandua tetradactyla (1914a)

Comments: This is the *Cagüaré* of Azara (1802, 1: 74) and *le Cagouaré* of Azara (1801, 1: 103). The Guaraní name *Kaguaré* means smelly beast of the forest (Azara, 1801).

“Family Dasypodidae”

Comments on Bertoni’s treatment of Dasypodidae (18–24): The taxonomy employed by Bertoni for the armadillos closely followed Yepes (1928), repeating many of the same errors found in that work. The armadillos are now classified in two families, Dasypodidae (for the genus *Dasypus*) and Chlamyphoridae (for all remaining genera; see Gibb *et al.*, 2016).

“18 *Euphractus sexcinctus gilvipes* (Ill.)”.

“Tatú poyú, Tatú–vai. Alto Paraná”.

ID = SIX-BANDED ARMADILLO *Euphractus sexcinctus flavimanus* A.G. Desmarest, 1804

Dasypus Linnaeus, 1758: 50

[*Dasypus*] *sexcinctus* Linnaeus, 1758: 51

lor[icatus]. flavimanus A.G. Desmarest, 1804: 28

[*Dasypus*] *gilvipes* Illiger, 1815: 108

Euphractus Wagler, 1830: 36

Dasypus sexcinctus (1914a)

Comments: This is the *Tatú Poyú* of Azara (1802, 2: 118), and the *Tatou Second*, *Tatou Poyou ou Tatou a main jaune* of Azara (1801, 2: 142). *Tatú Poyú* means armadillo with yellow hands. The less commonly used *Tatú–vai* means ugly armadillo, perhaps based on a belief in some communities in Paraguay that the species is inedible because of its tendency to eat carrion (Smith & Ríos, 2018). The name *Loricatus flavimanus* Desmarest is based on *Tatou poyou* of Azara (1801). *Dasypus gilvipes* Illiger, 1815, is a *nomen nudum*.

In following Yepes (1928), Bertoni was either unaware of, or rejected Osgood (1919: 33) who stated “The name *gilvipes*, now in use for the Paraguayan form of the six-banded armadillo, is antedated by two others, *flavipes* G. Fischer, 1814: 122, and *flavimanus* Desmarest, 1804”.

Comments on Cabassous (19–20): The taxonomy of the armadillos was poorly understood at the turn of the century and the principal student of the group was José Yepes. He published two key works on the “Dasypodidae” (Yepes, 1928, 1935), with a later work (Yepes, 1938) shedding further light on his approach to nomenclature. It appears that Bertoni may have had access only to Yepes (1928).

The nomenclature employed by Yepes differs from the current understanding, and did not recognize *C. chacoensis* Wetzel, 1980, in his samples. Yepes referred the large, long–

eared species now known as *Cabassous tatouay* to *C. uncinatus* throughout his works, and Bertoni (1939) followed this usage. From the morphometry and description provided, *C. uncinatus* of Yepes (1928) clearly refers to *C. tatouay*. Yepes (1935) listed *C. uncinatus* as present in the Argentine provinces of Chaco, Formosa, and Misiones, but later restricted this distribution to only Misiones in Yepes (1938). The only species of *Cabassous* known to occur in Misiones province today (Vizcaíno *et al.*, 2006) is *C. tatouay*. Consequently, Wetzel (1980) tentatively, but correctly synonymized Bertoni's (1939) citation of *uncinatus* with *tatouay*. *Cabassous loricatus* of Yepes is a composite species, containing the then undescribed *C. chacoensis* and the short-eared, northern South American species now known as *C. uncinatus*, as revealed by the distributions he provided for *Cabassous loricatus* (Yepes, 1928, 1935, 1938).

Yepes (1928) provided a detailed description of "*Cabassous uncinatus*", but Bertoni likely did not have access to the more detailed analysis of Argentine *Cabassous* by Yepes (1935), which contains a comparison between "*uncinatus*" and "*loricatus*". Though Bertoni included two species of *Cabassous* for Paraguay, his listing of *C. loricatus* is *fide* "Yepes" (Yepes, 1928), while his *C. uncinatus* (= *C. tatouay*) is based on a specimen from Puerto Bertoni. The conclusion that may reasonably be drawn is that Bertoni was personally acquainted only with the latter species.

Complicating matters is that *C. uncinatus* was later reported in Paraguay (Roguin, 1986). However, the southern subspecies (which includes Paraguayan populations) has since been split as *Cabassous squamicaudis* (Lund, 1845a: 35) by Feijó & Anacleto (2021). This species is closely associated with the Cerrado biome (Smith *et al.*, 2011), an ecoregion that appears poorly represented in the *Catálogo* as indicated by the absence of species that are particular to and common in that region in Paraguay.

"19 *Cabassous loricatus* Pelz".

"Paraguay (Yepes). "

ID = Unintended composite of CHACO NAKED-TAILED ARMADILLO *Cabassous chacoensis* Wetzel, 1980 and SOUTHERN NAKED-TAILED ARMADILLO *C. uncinatus* (Linnaeus, 1758)

[*Dasypus*] *Uncinatus* Linnaeus, 1758: 50

Cabassous McMurtrie, 1831: 164

Dasypus loricatus Wagner, 1855: 174

Cabassous chacoensis Wetzel, 1980: 335

Comments: The Chaco specimens of *Cabassous loricatus* as defined by Yepes (1935) were included in the synonymy of *C. chacoensis* by Wetzel (1980). However, Yepes (1935, 1938) provided a purely Argentine distribution and made no mention of the species as occurring in Paraguay. The only reference to the presence of *C. loricatus* in Paraguay in any of Yepes's works is the unsupported statement in the generalized species list in Yepes (1928), which by a process of elimination must have been Bertoni's source.

However, the distribution Yepes provided for *C. loricatus* "Guyanas, Paraguay, Brasil" is clearly a composite of species as *Cabassous chacoensis* does not occur in Brazil or the Guyanas. The contents of *C. loricatus sensu* Yepes (1928) thus differ from those of *C. loricatus sensu* Yepes (1935).

Consequently, Bertoni's usage of the name cannot be definitely associated with *Cabassous chacoensis*, except as an accident of misunderstanding (*contra* Roguin, 1986); nor can *C. loricatus sensu* Yepes (1935, 1938) be associated with Paraguay. The first reference

to *Cabassous chacoensis* in Paraguay is its description by Wetzel (1980). Bertoni's *C. loricatus* cannot be associated with any Paraguayan taxon, and appears to have been based entirely on the listing by Yepes.

"20 *Cabassous unicinctus* (L.)".

"Tatú ai – Puerto Bertoni".

ID = GREATER NAKED-TAILED ARMADILLO *Cabassous tatouay* (A.G. Desmarest, 1804)

[*Dasypus*] *Unicinctus* Linnaeus, 1758: 50

Lor[icatus]. *Tatouay* A.G. Desmarest, 1804: 28

Cabassous McMurtrie, 1831: 164

Lysiurus Ameghino, 1891: 254

Lysiurus unicinctus (1914a)

Comments: This is the *Tatú Tatuay* of Azara (1802, 2: 118), and the *Tatou Troisième ou Tatou Tatouay* of Azara (1801, 2: 155). Bertoni's use of the Guaraní name *tatú ai* confirms the identity as *Cabassous tatouay* (Desmarest, 1804). Azara (1801) could not confirm the origin of the name Taturaí, stating that the meaning "warty armadillo" was a poor fit and it was possibly a shortened form of Taturaí or "naked armadillo" in reference to the tail (Smith & Ríos, 2018).

Bertoni (1914a) had listed this species earlier for Puerto Bertoni. It is the only species in the genus known to occur in Alto Paraná department (Smith & Ríos, 2018).

"21 *Prionodontes giganteus* Cuv".

"Tatú-wasú, Tatú carreta. Still exists in the northern part of Paraguay. My friend Prof. Dr. Anisits⁴ had a live specimen. Amongst other peculiarities, he noted how it stood on its hind legs and walked slowly in the manner of the anteaters".

ID = GIANT ARMADILLO *Prionodontes maximus* (Kerr, 1792)

Dasypus maximus Kerr, 1792: 112

Dasypus giganteus É. Geoffroy-St. Hilaire, 1803: 207

Dasypus gigas G. Cuvier, 1817: 221

Prionodontes F. Cuvier, 1825: 257

Prionodontes: Schinz, 1845: 312

Prionodontes gigas (1914a)

Prionodontes giganteus (1931)

Comments: This is the *Tatú Máximo* of Azara (1802, 2: 110) and the *Tatou Premier ou Grand Tatou* of Azara (1801, 2: 132). The Guaraní name given by Bertoni (1939) *Tatú-wasú* is a bastardization of *Tatú guazú*, meaning big armadillo. *Tatú carreta*, the more commonly used local name for the species today means ox-cart armadillo.

The generic name *Prionodontes* employed by Bertoni has its origin in an incorrect spelling by Schinz (1845) and was not used by Yepes (1928). Bertoni (1914a) used the name *Prionodontes gigas* (G. Cuvier, 1817), but while Bertoni (1939) updated the nomenclature to *Prionodontes giganteus*, he still attributed authorship to Cuvier. Yepes (1928) correctly gave authorship of *giganteus* as É. Geoffroy St.-Hilaire, 1803. However, in his synonymy he listed the first usage of the name combination *Priononte* [sic] *giganteus* as Cuvier, 1822 and possibility that attribution may have contributed to Bertoni's usage.

⁴ This refers to the Hungarian-born botanist Johann Daniel Anisits (1856-1911).

“22 *Dasypus hybridus* (Desm.)”.

“Tatú–mburicá”

ID = SOUTHERN LONG–NOSED ARMADILLO *Dasypus hybridus* (A.G. Desmarest, 1804)

Dasypus Linnaeus, 1758: 50

lor[icatus]. Hybridus A.G. Desmarest, 1804: 28

Tatusia Lesson, 1827: 309

Tatusia hybrida (1914a)

Comments: This is the *Tatú Mulita* of Azara (1802, 2: 156) and the species name *Loricatus hybridus* Desmarest, 1804, is based on the *Tatou Sixieme ou Tatou mulet* of Azara (1801, 2: 186). The Guaraní name *Tatú–mburicá* means mule armadillo in reference to the long ears (Smith & Ríos, 2018). *Tatusia* Lesson, 1827, is a junior synonym of *Dasypus* Linnaeus, 1758.

Bertoni (1939) provided no Paraguayan locality for the species, suggesting that he was personally unfamiliar with it, and that its inclusion was probably based on Azara (1801; 1802). Feijó *et al.*, (2018) considered *D. hybridus* to be a subspecies of the seven–banded armadillo *Dasypus septemcinctus* Linnaeus, 1758, but given that the taxonomy of *Dasypus* remains far from resolved, I retain it as a distinct species pending further data.

“23 *Dasypus novemcinctus* (L.)”.

“Tatú–hû (Paraguay), Tatú–eté (Brazil). This is the species I have seen eating corpses. Puerto Bertoni. Asunción”.

ID = NINE–BANDED ARMADILLO *Dasypus novemcinctus* Linnaeus, 1758 (Figure 5)

Dasypus Linnaeus, 1758: 50

[*Dasypus*] *novemcinctus* Linnaeus, 1758: 51

Tatusia Lesson, 1827: 309

Tatusia novemcincta (1914a)



Figure 5. Nine-banded Armadillo *Dasypus novemcinctus*, Refugio Biológico Itabó, Alto Paraná department. (Photo: Paul Smaith).

Comments: This is the *Tatú Negro* of Azara (1802, 2: 144) and the *Tatou Cinquieme ou Tatou Noir* Azara (1801, 2: 175). The Guaraní name *Tatú-hû* is the most commonly used in Paraguay and means black armadillo (Azara, 1801). Bertoni also provided a Guaraní name used in Brazil, *Tatú-eté*, which translates roughly as the original or real armadillo. Bertoni (1939) placed the initial L. in parentheses, *contra* Yepes (1928).

“24 *Tolypeustes matacos* (Desm.)”.
“Chaco?”

ID = SOUTHERN THREE-BANDED ARMADILLO *Tolypeutes matacus* (A.G. Desmarest, 1804)

Tolypeutes Illiger, 1811: 111

lor[icatus]. Matacus A.G. Desmarest, 1804: 28

Tolypeutes matacos: Yepes, 1928: 478

Tolypeustes: A. de W. Bertoni, 1939: 8

Comments: This is the *Tatú Mataco* of Azara (1802, 2: 161), who did not cite the species for Paraguay. The name *Loricatus matacus* Desmarest, 1804, is based on the *Tatou Huitieme ou Tatou Mataco* of Azara (1801, 2: 197).

Bertoni repeated the incorrect spelling of the species name from Yepes (1928) and incorrectly spelled the generic name. This is a commonly encountered species in the Dry Chaco of Paraguay (Smith & Ríos, 2018), but Bertoni's inclusion of the species as a non-italicized “hypothetical” is indicative of his lack of familiarity with the Chacoan fauna.

“Order III UNGULATES”

“Family Tapiridae”

“25 *Tapirus terrestris* (L.)”.
“Tapií, Mboreví”.

“It is still very common in the forested region of Alto Paraná. Raymond de Laborde, naturalist and doctor in Guyana at the end of the 18th Century (who from my point of view knew our *Tapirus* better than his contemporaries) assures us that there is an ashy variety. This belief exists among the hunters across South America. In Paraguay they call the grey animals *tordillas*; and I, who saw 22 specimens in Alto Monday in 1897 alone, have noted that the face is always more or less grey and that this colour more or less extends in older individuals. The greyest form I have found was a very large specimen whose skeleton I sent to the Museo de La Plata (n°932. Yaguarasapá 1893). I have been able to confirm the accuracy of the belief that the individuals from the banks of the Paraná have a strong flavour, but this bears no relation to the colour and I attribute it to the water and the age or condition of the animal. What is completely correct is that all have a mane and that the border of the ear is white. The darkest specimens are known as *Mboreví-hovih* (blue tapirs). It occurs across the Chaco”.

ID = LOWLAND TAPIR *Tapirus terrestris* (Linnaeus, 1758)

Tapirus Brisson, 1762: 81

[*Hippopotamus*] *terrestris* Linnaeus, 1758: 74

Tapirus terrestris (1914a)

Comments: This is the *Mborebí* of Azara (1802, 1: 1) and Azara (1801, 1: 1). Raymond de Laborde was the King's physician at Cayenne in the second half of the 18th Century where

he made numerous observations on the fauna of French Guiana, and which were referred to in the works of Buffon and Lacépède (Daszkiewicz & de Massary, 2011).

“Family Tayassuidae”

“26 *Tayassu pecari* Fisch”.

“Tañihca-ti. Juveniles of the species are the individuals that hunters tell me belong to a so called “blonde” variety. The indians do not recognise such a variety”.

ID = WHITE-LIPPED PECCARY *Tayassu pecari* (Link, 1795) (Figure 6)

Tayassu G. Fischer, 1814: 284

S[us]. Pecari Link, 1795: 104

Sus albirostris Illiger, 1815: 108

Tayassu albirostris (1914a)



Figure 6. White-lipped Peccary *Tayassu pecari*, Fortín Toledo, Boquerón department. (Photo: Paul Smith).

Comments: This is the *Tañicatí* of Azara (1802, 1: 19) and *le Tagnicati* of Azara (1801, 1: 25). The Guaraní name means stinking mandible in reference to the white lip and the strong smell of the species associated with secretions from the rump gland.

The name *Tayassu albirostris* (Illiger, 1815) was employed by Bertoni (1914a) on the understanding that *Tayassu pecari* G. Fischer, 1814, was a junior homonym of *Sus pecari* Link, 1795, and that the latter was based on a collared peccary in Buffon (1763) as argued by Cabrera (1961). The priority of Link’s species name was demonstrated by Osgood (1921) and Hershkovitz (1966).

Bertoni surmised that reference by hunters to a “blonde variety” must be in reference to the juvenile. In fact, specimens with “leucism” have recently been reported from Brazil by Aximoff *et al.*, (2021) that perhaps fit the description of a “blonde

variety” more adequately than juveniles (which experienced hunters must surely have been familiar with). Such “blonde” individuals have also been reported in recent years from Enciso National Park in the Paraguayan Chaco (José Gaspar Insaurrealde photograph seen by author).

“27 *Pecari t. tajassu* (L.)”.

“Taitetú”.

ID = COLLARED PECCARY *Dicotyles tajacu* (Linnaeus, 1758)

[*Sus*] *Tajacu* Linnaeus, 1758: 50

[*Sus*] *Tajassu* Erxleben, 1777: 185

Dicotyles G. Cuvier, 1816: 237

Pecari Reichenbach, 1835: Taf. 21, fig. 2

Tayassu G. Fischer, 1814: 284

Tayassu tajassu (1914a)

Comments: This is the *Taitetú* of Azara (1802, 1: 23) and *le Taytétou* of Azara (1801, 1: 31). Today the most frequently used Guaraní name for this species is *kure-i* (little pig) and not *taitetú* (peccary).

The specific name *tajassu* (Erxleben, 1777) is a synonym of *Sus tajacu* Linnaeus, 1758. Bertoni (1939) correctly attributes the species authorship to Linnaeus, but incorrectly used Erxleben’s spelling. Acosta *et al.*, (2020) argued for the revalidation of the generic name *Dicotyles* G. Cuvier, 1816, over *Pecari* Reichenbach, 1835.

“Family Cervidae”

“28 *Odocoileus bezoarticus* (L.)”.

“Gwasú-ti”.

ID = PAMPAS DEER *Ozotoceros bezoarticus* (Linnaeus, 1758)

Cervus Linnaeus, 1758: 66

[*Cervus*] *Bezoarticus* Linnaeus, 1758: 67

Cervus campestris F. Cuvier, 1817: 484

Odocoileus Rafinesque, 1832: 109

Blastocerus Wagner, 1844: 366

Ozotoceros Ameghino, 1891: 243

Blastocerus bezoarticus: Trouessart, 1904: 707

Cervus campestris (1904b; 1915)

Blastocerus campestris (1914a)

Comments: This is the *Güazutí* of Azara (1802, 1: 41) and *le Deuxieme Cerf ou Gouazouti* of Azara (1801, 1: 77). The name means “white deer” (contraction of *Guazu Moroti*) in reference to the white colouration of the underparts (Azara, 1802).

Cervus campestris F. Cuvier, 1817, is a synonym of *Odocoileus virginianus cariacou* (Boddaert, 1784: 136), but was long considered to be applicable to the pampas deer, because of the erroneous association of that name with Azara’s *Güazutí* by Cuvier (Cabrera, 1943). The usage of this name as a subspecies for the Paraguayan population (J.A. Allen, 1916a, Sanborn, 1929) is invalid (Miranda-Ribeiro, 1919). The history of the nomenclature of this species is explained in detail by Cabrera (1943). Nomenclatural issues arising from the inclusion of this species in *Blastocerus* Wagner, 1844 (i.e., Bertoni, 1914a) were discussed by Grubb (2000).

“29 *Odocoileus paludosus* (Desm.)”.

“Gwasú-pucú”.

ID = MARSH DEER *Blastocerus dichotomus* (Illiger, 1815)

Cervus dichotomus Illiger, 1815: 117

cervus paludosus A.G. Desmarest, 1822: 443

Odocoileus Rafinesque, 1832: 109

Blastocerus Wagner, 1844: 366

Blastocerus paludosus (1914a)

Comments: This is the *Güazúpucú* of Azara (1802, 1: 33) and *le Premier Cerf ou Gouazoupoucou* of (1801, 1: 70). *Cervus dichotomus* Illiger, 1815, and *Cervus paludosus* Desmarest, 1822, are both based on this description. The Guaraní name *Gwasú-pucú* means “tall deer”, this being the largest Paraguayan deer species.

The validity of the generic name *Blastocerus* Wagner, 1844, was discussed in detail by Grubb (2000), who noted that the lectotype is a *Cervus paludosus* Desmarest, 1822, and in the process, identified *Blastoceros* Fitzinger, 1873: 358, as an unjustified emendation; not a senior synonym of *Ozotoceros* Ameghino, 1891.

Comments on Bertoni’s treatment of *Mazama* (30–34): The *Catálogos* greatly multiplies the number of species of *Mazama* present in Paraguay, and Bertoni’s uncertainty as to his identifications is hinted at when he mentions transitory forms that “cause confusion”. In an attempt to address the confusion surrounding *Mazama*, J.A. Allen (1915) recognized two species in Paraguay, the brown *M. simplicicornis* (Illiger; = *Subulo gouazoubira*) and the red *M. rufa rufa* (Illiger; = *M. americana*). Nevertheless, neither J.A. Allen (1915) nor Miller (1930), who used the same nomenclature, appear to have been Bertoni’s source. Bertoni’s use of the name *M. americana* is key to identifying his source, that name being used by Thomas (1913c) for the red brocket, although earlier Osgood (1912) used the name for the brown brocket. Disregarding J.A. Allen (1915), Miranda-Ribeiro (1919), followed Thomas (1913c) on this issue, and provided a key to the species. Thus, I suspect that Bertoni’s (1939) principal source for *Mazama* was Thomas (1913c), while Hensel (1872) seems to have been influential for Bertoni (1914a).

“30 *Mazama nana* (Lund)”.

“Mbororó. I believe this to be a dwarf species I killed in Puerto Bertoni”.

ID = LESSER BROCKET *Mazama nanus* (Hensel, 1872)

Mazama Rafinesque, 1817: 363

Coassus J.E. Gray, 1825: 342

[*Cervus*] *nanus*? Lund, 1841: 133

C[ervus]. *nanus* Hensel, 1872: 99

Coassus nanus (1914a)

Comments: Bertoni expresses doubt as to whether or not the deer he hunted belongs to this species (possibly because it was omitted from Miranda-Ribeiro’s (1919) key), but it seems probable that it was, as this is the only *Mazama* in Paraguay that might be described as “dwarf”.

Hensel (1872) used the name *Cervus rufinus* (Pucheran, 1851) and regarded *Cervus nanus* Lund, 1841 as a synonym. Lund's name was a *nomen nudum* that was validated through Hensel's misidentification, making Hensel the author.

"31 *Mazama simplicicornis* (Ill.)".

"Gwasú-virá. It is common in Paraguay, but doesn't penetrate the great forests of Alto Paraná. Asunción, central Paraguay and the south".

ID = BROWN BROCKET *Subulo gouazoubira* (G. Fischer, 1814) (Figure 7)

Cervus gouazoupira G. Fischer, 1814: 465

Cervus simplicicornis Illiger, 1815: 108

Cervus nemorivagus F. Cuvier, 1817: 485

Mazama Rafinesque, 1817: 363

Coassus J.E. Gray, 1825: 342

Subulo C.H. Smith, 1827: 318

Mazama gouazoubira: Hershkovitz, 1951: 567

Coassus nemorivagus (1914a)



Figure 7. Brown Brocket *Subulo gouazoubira*, Río Negro, Alto Paraguay department. (Photo: Paul Smith).

Comments: This is the *Güazu-birá* of Azara (1802, 1: 57), and the name means roughly deer that you would like to repeat, in reference to its attractiveness for the table. The name *Cervus gouazoupira* G. Fischer, 1814, is based on *le Quatrieme Cerf ou Gouazoubira* of Azara (1801, 1: 86; Hershkovitz, 1951), but the original spelling was considered a *lapsus* (Cabrera, 1961) because it differed from the spelling used by Azara. The amended *M. gouazoubira*

has since been conserved through a successful petition to the ICZN (Gardner, 1999; ICZN, 2001). *Cervus simplicicornis* Illiger, 1815, is also based on Azara's (1801) description, but G. Fischer's (1814) name has priority. The generic name *Subulo* Smith, 1827 was resurrected by Bernegossi *et al.*, (2023) for the brown brocket and a Paraguayan neotype designated.

Cervus nemorivagus F. Cuvier, 1817, was associated erroneously by Bertoni with Azara's description, but the type locality "Cayenne" identifies it as a different species, the Amazonian brown brocket *Passalites nemorivagus* (F. Cuvier, 1817).

"32 *Mazama rondoni* Mir. Rib. = *M. nemorivaga* (F. Cuv.)?"

"Río Paraguay, Jardín Zoológico. These cervids sometimes demonstrate transitory variations between the allied species, causing confusion".

ID = BROWN BROCKET *Subulo gouzoubira* (G. Fischer, 1814)

Cervus nemorivagus F. Cuvier, 1817: 485

Mazama Rafinesque, 1817: 363

Mazama gouazoubira rondoni Miranda-Ribeiro, 1914: 33

Cervus gouazoupira G. Fischer, 1814: 465

Subulo C.H. Smith, 1827: 318

Mazama gouazoubira: Hershkovitz, 1951: 567

Comments: The comment about the confusion caused by transitory forms reflects Bertoni's (1939) uncertainty with the taxonomy he employed. Indeed, the cryptic species limits in this genus are still unresolved, and morphologically similar forms may be polyphyletic (Duarte *et al.*, 2008).

Bertoni's proposed synonymization of *Mazama rondoni* with *M. nemorivaga* was tentative, but correct, and the latter name has priority. Rossi (2000) recognised *M. nemorivaga* as a distinct species confined to northern South America with a largely Amazonian distribution. Consequently, based on current knowledge, it seems that Bertoni applied all of these names to the same species, *M. gouzoubira*, of which only the nominate subspecies occurs in Paraguay.

"33 *Mazama rufina* (Puch.)".

"Mbororó – Alto Paraná, Paraguay!, Argentina!, Brasil. Común".

ID = DWARF BROCKET *Mazama nanus* (Hensel, 1872)

Mazama Rafinesque, 1817: 363

Coassus J.E. Gray, 1825: 342

Cervus rufinus Pucheran, 1851: 561

C[ervus]. *nanus* Hensel, 1872: 99

Coassus rufinus (1914a)

Comments: Bertoni clearly used the name *M. rufina sensu* Hensel (1872) and Miranda-Ribeiro (1919) in reference to *Mazama nana*. Interestingly, he referred to this species as "common" in Paraguay, even though Miranda-Ribeiro (1919: 284) noted its "extreme rarity", which reflects the situation today (Cartes *et al.*, 2017). The duplicate listing (with number 30 *Mazama nana*) clearly stems from Bertoni's confusion concerning the taxonomy of Paraguayan deer. *Mazama rufina* (Pucheran, 1851), as currently understood, is confined to montane forests of the Andes from Colombia into northern Perú (Czernay, 1987).

“34 *Mazama americana* (Gm.)”.

“Gwasú–pihtâ. Common in all the forests of eastern Paraguay, Misiones Argentina and Paraná Brazil, even Asunción”.

ID = ATLANTIC FOREST RED BROCKET *Mazama americana rufa* (Illiger, 1815)

[*Moschus*] *americanus* Erxleben, 1777: 324

[*Moschus*] *americanus* J.F. Gmelin, 1788: 174

Cervus rufus Illiger, 1815: 117

Mazama Rafinesque, 1817: 363

Coassus J.E. Gray, 1825: 342

Coassus rufus (1914a)

Comments: This is the *Güazú–pitá* of Azara (1802, 1: 51) and *le Troisieme Cerfou Gouazoupita* of Azara (1801, 1: 82), meaning red deer. Illiger (1815) based *Cervus rufus* on Azara (1802) and *M. americana rufa* is the valid subspecific name for Paraguayan populations, though it is perhaps worthy of species status (J.A. Allen, 1915; Luduvério, 2018). The type locality was restricted to “Asunción, Paraguay” by Cabrera (1961), but recently Luduvério (2018) designated a neotype from “Avenida das Cataratas (BR–469), Foz do Iguaçu, Paraná state, Brazil”, now the correct type locality.

Bertoni (1939) listed Gmelin (1788) as the author of *Moschus americana*, but Erxleben’s (1777) use of the same name has priority.

“Order IV RODENTS”

“Family Sciuridae”

“35 *Sciurus ingrami* Thos”.

“Wareruâ (according to the Avá–chiripá tribe of Monday). It occurs in Santa Ana and Iguazú – Misiones, Argentina, though I have never found it on the Paraguayan side of the Paraná. Notwithstanding, the Guaraní of Alto Monday recognize it and claim that two species exist in Paraguay. If this is correct, the second must be *S. variabilis* Is. Geoff. of Brazil and Bolivia; but scientific rigour demands that this be proven before it is included in the Paraguayan fauna. The Guayaná call it kuaatí–serelepé. My specimen is grey”.

ID = BRAZILIAN SQUIRREL *Guerlinguetus brasiliensis* (J.F. Gmelin, 1788)

Sciurus Linnaeus, 1758: 63

[*Sciurus*] *aestuans* Linnaeus, 1766: 88

[*Sciurus*] *brasiliensis* J.F. Gmelin, 1788: 151

Guerlinguetus J.E. Gray, 1821: 304

Sciurus Ingrami Thomas, 1901b: 368

Sciurus aestuans (1914a)

Comments: Bertoni (1939) did not confirm the occurrence of this species in Paraguay, reporting it only as of possible occurrence. Despite the assertion that the Avá–chiripá of Alto Monday (Alto Paraná department) knew of the presence of two species of squirrel in Paraguay, no squirrels have to date been recorded in the Oriental region. The only native squirrels documented as occurring in Paraguay are from Alto Paraguay department in the northern Chaco (D’Élia *et al.*, 2008a, Timm *et al.*, 2015), an area that Bertoni did not visit.

The type locality of *Sciurus brasiliensis* Gmelin, 1788, was restricted to “Pernambuco, Brazil” by de Vivo & Carmignotto (2015). The name *Sciurus ingrami* Thomas, 1901b, as

currently understood, refers to a similar species confined to coastal southeast Brazil (Alvarenga & Talamoni, 2005), nevertheless, the taxonomy of South American squirrels is far from resolved (Abreu–Junior *et al.*, 2020).

“Family Muridae”

“The systematics and distribution of the native rats in South America still leaves much to be desired; the synonymy is not well resolved either. It is to be expected that future investigation will considerably raise the number of species in the list, especially on the Chaco side. To not depart from exactitude, I omit the species that closely surround us”.

Comments on Bertoni’s treatment of “Muridae” (36–57): Bertoni (1914a, 1939) included all species of mice in the family Muridae. With the exception of the introduced species (numbers 42–45), all species Bertoni listed are now placed in the family Cricetidae, subfamily Sigmodontinae. The inclusion of introduced human commensals in the list means that reference to the omission of species that “*nos rodean de muy cerca*” (closely surround us), should be understood as reference to species that occur in neighbouring countries and not referring to species now in the genera *Mus* or *Rattus*.

Bertoni’s (1939) treatment of the Muridae is a reflection both of how little was known about the cricetid fauna of South America at that time, but also how unfamiliar that Bertoni himself was with the taxonomy of these species. While correct that future investigation would greatly increase our knowledge of the distribution of Paraguayan rats and mice (this process is still not complete), Bertoni’s list either lacked names or applied them incorrectly to species that had been described based on Paraguayan types and that remain common today. For example, the Chaco leaf-eared mouse *Phyllotis chacoensis* J.A. Allen, 1901: 408 (= *Graomys chacoensis*; type locality Waikthlating-wayalwa, Chaco boreal, Paraguay; collected by Graham Kerr, 5 September 1897) is not listed under its obvious synonym, nor is the monte akodon *Akodon arviculoides montensis* Thomas, 1913a: 405 (= *Akodon montensis*; type locality Paraguay, Sapucay; collected by W. Foster, 31 July 1903), that is perhaps the most abundant rodent in the Atlantic Forest. Bertoni must surely have been familiar at least with the latter species, even if he recognized it under another name. It seems obvious that his usage of names is not always consistent with current taxonomy, and thus care is required when interpreting them.

My conclusion is that Bertoni’s lack of taxonomic clarity (reflecting not only the lack of data available at that time, but also lack of access to the principal literature) most probably led to his unreliable application of names. The scarcity of exact localities Bertoni provided suggests he relied heavily on published sources for this section of the list. The only reference that Bertoni specifically mentions in his murid section is that of Trouessart. Most likely this refers to Trouessart (1897) and not to either 1880 or 1905, as the updated work (1905) lists numerous species for Paraguay that were not listed by Bertoni, while the 1880 work uses different genera in several instances. Bertoni (1939) also relied heavily on Azara (1802). Tate (1932) is the only work antedating the *Catálogo* that tried to apply Latin binomials to all of Azara’s descriptions. However, Tate’s approach was from a global standpoint, rather than a focus on the Paraguayan mastofauna.

Taxonomic confusion continues to this day and this section of my interpretation of Bertoni's listings is more speculative than are other areas. However, I have attempted to highlight the possible issues related to Bertoni's usage of the names rather than directly applying modern synonymy. In some cases, Bertoni's names likely apply to "composite" species, whereas in others, multiple names may apply to a single species.

"36 *Akodon arenicola* (Waterh.)".

"Paraguay".

ID = AZARA'S AKODON *Akodon azarae* (J.B. Fischer, 1829)

M[us]? *Azarae* J.B. Fischer, 1829: 325

Akodon Meyen, 1833: 599

Mus arenicola G.R. Waterhouse, 1837: 18

Akodon arenicola (1914a)

Comments: *Akodon arenicola* (type locality: Maldonado) is a junior synonym of *Mus azarae* J.B. Fischer, 1829, the latter having been based on *Raton agreste* of Azara (1802, 2: 94). Azara collected the species outside the boundaries of Paraguay at 30.5 degrees south, later restricted to São Gabriel, Rio Grande do Sul, Brazil, by Pardiñas *et al.*, (2007).

Trouessaert (1897) included "Paraguay" within the distribution of this species and may have been Bertoni's (1939) source. That Bertoni was probably not personally familiar with the species is indicated by the lack of a specific locality being provided. However, most of the sources that Trouessart (1897) listed (Waterhouse, 1837, 1839; Hensel, 1872a; Leche, 1886) do not mention Paraguay in the distribution of this species. The only one that does is Burmeister (1879) who stated that Azara "described it from among the species of Paraguay". This is factually incorrect, but suggests that Trouessart (1897), and by proxy Bertoni (1939), both probably listed this species for Paraguay in error even though the species does occur in the country.

"37 *Akodon fuliginosus* (Wagn.)".

"Puerto Bertoni! São Paulo – Brazil. Common".

ID = EBONY AKODON *Thaptomys nigrita* (H. Lichtenstein, 1829)?

Mus nigrita H. Lichtenstein, 1829: 7, pl. 35

Akodon Meyen, 1833: 599

Hesperomys fuliginosus Wagner, 1845: 148

Thaptomys Thomas, 1916: 339

Akodon fuliginosus (1914a)

Comments: Bertoni's locality "San Pablo" (= Ypanema) is a reference to the type locality of *Hesperomys fuliginosus* Wagner, 1845, that Costa *et al.*, (2003) identified as Floresta Nacional de Ipanema, 20 km NW Sorocaba, São Paulo state, Brazil. The Brazilian locality is in addition to what are presumably Bertoni's records from Puerto Bertoni. This name is considered a synonym of *Thaptomys nigrita* (Lichtenstein, 1829), but this is by no means is a common species in Paraguay today. Bertoni (1939) may have been referring to another species, and thus I list it with a query here.

“38 *Akodon obscurus* (Waterh.).”

“Paraguay, Argentina, Uruguay; Alto Paraná; Chaco (1932).”

ID = *Necomys* sp.; containing at least the HAIRY-TAILED AKODONT *Necomys lasiurus* (Lund, 1840b) and perhaps the PARAGUAYAN AKODONT *Necomys lenguarum* (Thomas, 1898)

Akodon Meyen, 1833: 599

Mus obscurus G.R. Waterhouse, 1837: 16

Mus lasiurus Lund, 1840b: 50

Necomys Ameghino, 1889: 120

Akodon lenguarum Thomas, 1898: 271

Akodon obscurus (1914a)

Comments: *Akodon obscurus* was listed for Paraguay by Trouessart (1897). The distribution given by Trouessart (Argentina, Maldonado, Paraguay, Uruguay, Montevideo) indicates that the name was applied to what we know today was a composite. Trouessart’s *Akodon obscurus* usually is included in the synonymy of *Necomys obscurus*, a species that is currently considered restricted to the coast of central Argentina and southern Uruguay. The distribution provided by Bertoni (a repeat of the composite distribution by Trouessart) can be assumed to include several *Necomys* species, but not *Necomys obscurus*.

The taxonomic history of the genus *Necomys* is complex (Galliari & Pardiñas, 2000; D’Elia *et al.*, 2008b). Two species are currently recognized as present in Paraguay: the widespread hairy-tailed akodont *Necomys lasiurus* (Lund, 1840b), which occurs in both regions of the country; and the Paraguayan akodont *Necomys lenguarum* (Thomas, 1898), which is known only from the Chaco region. The latter has a Paraguayan type locality (Waikthlatingmayahva, northern Chaco of Paraguay), in Presidente Hayes department, collected by J. Graham Kerr, 10 May 1897. Bertoni’s (1914a, 1939) failure to cite this name suggests he was unaware of it. Perhaps of significance, “*Akodon lenguarum*” was not included in the rodent section of Trouessart’s (1897) first volume, but was listed in his second (Trouessart 1898) as an addendum. This further indicates that Bertoni had access only to the 1897 volume.

If this interpretation is correct, the locality Alto Paraná provided by Bertoni (1939) must refer to *N. lasiurus*, this being one of the most abundant rodents in the Atlantic Forest region where Bertoni worked. However, Bertoni (1939) also included “Chaco 1932”, apparently in reference to a record from west of the Paraguay River (that I have been unable to trace, if indeed it was published). That specimen could pertain to either species, raising the possibility of this being a name applied to a composite of *Necomys* species.

“39 *Akodon subterraneus* (Hensel).”

“Puerto Bertoni! Rio Grande do Sul. Common”.

ID = EBONY AKODON *Thaptomys nigrita* (H. Lichtenstein, 1829)?

Mus nigrita H. Lichtenstein, 1829: 7, pl. 35

Akodon Meyen, 1833: 599

Hesperomys subterraneus Hensel, 1872b: 44

Thaptomys Thomas, 1916: 339

Akodon subterraneus (1914a)

Comments: Bertoni provided the locality “Rio Gr. Do Sul” in reference to the type locality of *Hesperomys subterraneus* Hensel, 1872b (= Provinz Rio Grande do Sul), in addition to what are presumably his own records from Puerto Bertoni. This name is considered a synonym of *Thaptomys nigrita* (Lichtenstein, 1829), but in a situation similar to number 37, *Akodon fuliginosus*, the description of the species as “common” makes it questionable and Bertoni (1939) clearly thought that he was making reference to two different species. It seems likely that another species was intended here, so the identification based on synonymy is listed here with a query.

“40 *Holochilus vulpinus* (Licht.)”.
 “Puerto Bertoni”.

ID = CRAFTY MARSH RAT *Holochilus vulpinus* Brants, 1827
M[us]. vulpinus Brants, 1827: 137
Mus vulpinus H. Lichtenstein, 1829: Tafel 33, Fig. 2
 (*Holochilus*) Brandt, 1835: 428; subgen. nov.

Comments: The correct author of this taxon is Brants (1827) not Lichtenstein (1829), though Brants credited Lichtenstein, who was at the time director of the Berlin Museum where the specimen was displayed (HersHKovitz, 1944).

“41 *Holochilus chacararius* Thos”.
 “Central Paraguay”.

ID = CHACO MARSH RAT *Holochilus chacarius* Thomas, 1906
 (*Holochilus*) Brandt, 1835: 428
Holochilus chacarius Thomas, 1906: 446
Holochilus chacararius: Bertoni, 1939: 9

Comments: *Holochilus chacarius* is based on a female type from Paraguay collected 12 March 1900 by T. Insley at Chaco, 1 league NW of Concepción, which places the locality in Presidente Hayes department. This locality is broadly consistent with Bertoni’s geographical term “Centro”.

“42 *Mus musculus* L”.
 “House Mouse. Tends to have a cinnamon colouration”.

ID = HOUSE MOUSE *Mus musculus* Linnaeus, 1758
Mus Linnaeus, 1758: 59
 [*Mus*] *Musculus* Linnaeus, 1758: 62
Mus musculus (1914a)

Comment on the use of the generic name *Epimys* Trouessart, 1881 (43–45): Although Bertoni used *Epimys* for the introduced human commensal murids, the priority of *Rattus* G. Fischer, 1803, (originally misspelled *Ruttus*) over *Epimys* Trouessart, 1881 was demonstrated by Hollister (1916). The continued use of *Epimys* by Bertoni (1939) two decades later suggests that the principal source of his nomenclature for these rats predates Hollister (1916) and by a process of elimination was likely Trouessart (1897).

“43 *Epimys decumanus maurus* (Waterh.)”.

“House Rat. Rarely observed in the country”.

ID = BROWN RAT *Rattus norvegicus* (Berkenhout, 1769)

Mus Linnaeus, 1758: 59

[MUS] *Norvegicus* Berkenhout, 1769: 5

MVS (*decumanus*) Pallas, 1778: 91

Ruttus G. Fischer, 1803: 128

Mus Maurus G.R. Waterhouse, 1837: 20

Epimys Trouessart, 1881: 117

Mus decumanus maurus (1914a)

Comments: *Epimys decumanus maurus* was the scientific name used by Trouessart (1897) with the distribution given as “America merid., Europa, Gallia (Paris)”. It is the only subspecies with a South American distribution in Trouessart’s text, and presumably for this reason the name was applied by Bertoni (1939).

The Spanish common name *rata doméstica* (house rat) is associated with the brown rat. Though the invasive brown rat is certainly less common than the black rat in Paraguay today, it is no longer accurate to say that it is “rarely observed”. Indeed, it may be more closely associated with urban areas than the black rat, which appears to be more common in rural areas.

“44 *Epimys rattus setosus* (Lund.)”.

“Black Rat. Asunción”.

ID = BLACK RAT *Rattus rattus* (Linnaeus, 1758)

Mus Linnaeus, 1758: 59

[Mus] *Rattus* Linnaeus, 1758: 61

Mus alexandrinus É. Geoffroy St.-Hilaire, 1803: 192

Ruttus G. Fischer, 1803: 128

Rattus setosus Lund 1841: 277

Epimys Trouessart, 1881: 117

Mus rattus (1914a)

Mus rattus alexandrinus (1914a)

Comments: The use of this name follows Trouessart (1897) who listed the distribution of the subspecies *setosus* as “America merid., Brasil, La Plata”. It seems that Bertoni (1939) considered this the subspecific name applicable to Paraguayan populations, as no other name was provided by Trouessart (1897) for mainland South American members of this species. The Spanish common name *rata negra* (black rat) is associated with the black rat (Aulagnier *et al.*, 2009).

“45 *Epimys rattus norvegicus* (Erxl.)”.

“Asunción; Alto Paraná”.

ID = BROWN RAT *Rattus norvegicus* (Berkenhout, 1769)

[Mus] *Rattus* Linnaeus, 1758: 61

[MUS] *Norvegicus* Berkenhout, 1769: 5

[MVS] *noruegicus* Erxleben, 1777: 381

Ruttus G. Fischer, 1803: 128

Epimys Trouessart, 1881: 117

Comments: Trouessart (1857) listed *Mus norvegicus* (Klein, 1751: 56) as a synonym of his *Epimys decumanus*, but Bertoni (1939) diverges from that text by first including the name as a subspecies of the black rat *Epimys rattus* and then attributing authorship of the name to Erxleben (as was a common custom at that time).

The presence of two subspecies of “*Epimys rattus*” in Asunción would seem fanciful, and it is likely that this may be a reflection of nomenclatural confusion by Bertoni. As both the black and brown rat occur in Asunción, I tentatively assign this name to the brown rat on the basis of the subspecific epithet, and suggest that Bertoni (1939) used this nomenclature because of over-reliance on Trouessart (1897).

“46 *Nectomys squamipes* (Licht.)”.

“Alto Paraná, Paraguay; Puerto Bertoni. Yavevihrih – Argentina”.

ID = ATLANTIC WATER RAT *Nectomys squamipes* (Brants, 1827)

M[us]. squamipes Brants, 1827: 138

Nectomys W.C.H. Peters, 1861: 151

Nectomys squamipes (1914a)

Comments: Two species of *Nectomys* occur in Paraguay, *Nectomys rattus* (Pelzeln, 1883: 73) and *Nectomys squamipes* (Brants, 1827). The extent of overlap in the distribution of the two is unclear (Bonvicino & Weksler, 2015). However, Bertoni (1939) made reference to the Alto Paraná region of Paraguay (a region dominated by Atlantic Forest) where *N. squamipes* might be expected to occur, and as it is the only *Nectomys* species in Misiones, Argentina, there is little doubt that Bertoni’s identification was correct. “Yavevihrih – Argentina” presumably refers to the Arroyo Yabebyry, close to the old Jesuit Mission of Santa Ana, Misiones Province, Argentina, that drains into the Paraná and is where the Bertoni family resided briefly when they first migrated to South America in 1884 (Contreras, 2019).

According to Peters (1861), Brants credited authorship of the name to Lichtenstein (then director of the Berlin Museum) (Hershkovitz, 1944), explaining Bertoni’s erroneous attribution of authorship.

“47 *Oryzomys flavescens* Wath”.

“Alto Paraná”.

ID = FLAVESCENT COLILARGO *Oligoryzomys flavescens* (G.R. Waterhouse, 1837)

Mus flavescens G.R. Waterhouse, 1837: 19

Oryzomys Baird, 1857: 458

Oligoryzomys Bangs, 1900: 94

“48 *Oryzomys angouya* (Desm.)”.

“Anguyá pihtâ – Asunción”.

ID = ANGOUYA SOORETAMYS *Sooretamys angouya* (G. Fischer, 1814)

M[us]. Angouya G. Fischer, 1814: 71

Mus Angouya A.G. Desmarest, 1819: 62

Mus Anguya Rengger, 1830: 229

Oryzomys Baird, 1857: 458

Sooretamys Weksler, Percequillo & Voss, 2006: 23

Oryzomys angouya (1914a)

Comments: *Mus angouya* G. Fischer, 1814, is based on the *Rat Troisieme ou Rat Angouya* of Azara (1801: 86) and this also is the *Raton Anguyá* of Azara (1802, 2: 89). Azara (1802) stated that the specimens were from the “side of a hidden ravine near Atirá” (= Atyra, Cordillera department). Musser *et al.*, (1998) later designated a neotype (UMMZ 124201) from Paraguay east of the Río Paraguay, Departamento de Misiones, 2.7 km (by road) N San Antonio, collected by P. Myers on 22 August 1976.

The attribution of authorship of the name to Desmarest (1819) reflects the doubt in the early 20th Century regarding the validity of the names authored by G. Fischer (1814). The Guaraní name *Anguyá pihtâ* means “red mouse”. See number 55 *Oxymycterus nasutus*.

“49 *Oryzomys cephalotes* (Desm.)”.

ID = AZARA’S HYLAEAMYS *Hylaeamys megacephalus* (G. Fischer, 1814)

M[us]. megacephalus G. Fischer, 1814: 71

Mus cephalotes A.G. Desmarest, 1819: 63

Oryzomys Baird, 1857: 458

Hylaeamys Weksler, Percequillo & Voss, 2006: 14

Oryzomys cephalotes (1914a)

Comments: *Mus megacephalus* G. Fischer, 1814, and *Mus cephalotes* Desmarest, 1819, are both based on Azara’s (1801, 2: 82) *Rat Second ou Rat a Grose Tete*, and this also is the *Raton del cola igual al cuerpo* of Azara (1802, 2: 87). Bertoni’s (1939) failure to provide a locality suggests that his listing was based on a literature citation (likely Azara), even though Azara provided a locality—San Ignacio Guazu in present day Misiones department. Musser *et al.*, (1998) later designated a neotype (UMMZ 133811) from “Paraguay east of the Río Paraguay, Departamento de Canendiyú (sic), 13.3 km (by road) N Curuguaty 24° 31’ S, 55° 42’ W”, collected by P. Myers on 18 July 1979.

Comments on presumed *Oligoryzomys nigripes* (50–52): The provision of a locality for number 50 suggests that the name *Oryzomys longicaudatus* was applied to a specimen of a mouse Bertoni was familiar with. The lack of localities provided for numbers 51 and 52 suggests the opposite, and that those names were derived from the literature (the former certainly from Rengger, 1830, and the latter probably from Azara, 1802). I hypothesize that Bertoni’s lack of familiarity with rodent taxonomy led to the use of three names for the same species.

“50 *Oryzomys longicaudatus* (Benn.)”.

“Yaguarasapá”.

ID = BLACK-FOOTED COLILARGO *Oligoryzomys nigripes* (Olfers, 1818)

M[us]. nigripes Olfers, 1818: 209

Mus longicaudatus Bennett, 1832: 2

Oryzomys Baird, 1857: 458

Oligoryzomys Bangs, 1900: 94

Oryzomys longicaudatus (1914a)

Comments: The long-tailed colilargo *Oligoryzomys longicaudatus* (Bennett, 1832) is restricted to southern Argentina and Chile, well to the south of Paraguay. However, the name has been misapplied over time to several other species of mice. A resemblance

between this species and *O. nigripes* was noted by Thomas (1926), and repeated and expanded to include *O. chacoensis* Myers & Carleton, 1981: 19, in the later description of that species. It would seem that Bertoni (1939) was (consciously or otherwise) referring to one of these latter two; although the locality provided, “Yaguarasapá” (= Capitán Meza) lies within the distribution of only *O. nigripes*. *Oligoryzomys chacoensis* is distributed almost entirely on the western side of the Paraguay River, while *O. nigripes* is abundant in the Atlantic Forest zone of the Oriental region and thus seems much the most likely candidate.

“51 *Oryzomys longitarsus* (Rengg.)”.

ID = BLACK-FOOTED COLILARGO *Oligoryzomys nigripes* (Olfers, 1818)

M[us]. nigripes Olfers, 1818: 209

Mus Longitarsus Rengger, 1830: 232

Oryzomys Baird, 1857: 458

Oligoryzomys Bangs, 1900: 94

Oryzomys longitarsus (1914a)

Comments: *Mus longitarsus* Rengger, 1830, is based on a now lost specimen collected on the banks of the Paraguay River north of Villa-Real (= Concepción, Concepción department). Both *O. nigripes* and *O. mattogrossae* (J.A. Allen, 1916b) occur in that area. Myers & Carleton (1981) suggested that Rengger’s description could refer to *O. mattogrossae*, which at that time was treated as part of a broader concept of *O. fornesi* (Massoia, 1973). Myers & Carleton (1981) concluded that Rengger’s description was not diagnostic and the name probably was best considered a *nomen dubium*. The mention of black soles of the feet, however, seem to associate it clearly with *O. nigripes*, of which it is usually considered a junior synonym.

“52 *Oryzomys nigripes* (Desm.)”.

ID = BLACK-FOOTED COLILARGO *Oligoryzomys nigripes* (Olfers, 1818)

M[us]. nigripes Olfers, 1818: 209

Mus nigripes A.G. Desmarest, 1819: 64

Oryzomys Baird, 1857: 458

Oligoryzomys Bangs, 1900: 94

Oryzomys nigripes (1914a)

Comments: Both *Mus nigripes* Olfers, 1818, and *Mus nigripes* Desmarest, 1819, are based on *Le Rat Sixième ou Rat a Tarse Noir* of Azara (1801, 2: 98), which also is the *Colilargo* of Azara (1802, 2: 91). These descriptions were based on two females collected by Don Josef Castelví on his quinta at Atira (Cordillera department). Myers & Carleton (1981) provided a detailed discussion of Azara’s texts and why they refer to this species, and designated a neotype (UMMZ 133872) from Ybycuí National Park, Department Paraguari, Paraguay, collected on 20 June 1979 by P. Myers.

The use of *Oryzomys nigripes* (Desmarest, 1819) by Bertoni (1939) stemmed from the fact that Olfers (1818) had not yet been discovered. This latter publication was later brought to light by Hershkovitz (1959a).

“53 *Oryzomys pyrrhorhinus* (Wied)”.
 “Santisima Trinidad”.

ID = UNIDENTIFIABLE

Mus pyrrhorinos Wied–Neuwied, 1821: 177

Mus pyrrhorhinus Wied–Neuwied, 1823: pl. 23

Oryzomys Baird, 1857: 458

Oryzomys pyrrhorhinus: Bertoni, 1914a: 73

Oryzomys pyrrhorhinus (1914a)

Oryzomys pyrrhorhinus (1914b)

Comments: Confusion reigned over the generic placement of Wied’s *Mus pyrrhorhinus* (Thomas, 1882, 1884, 1886; Osgood, 1933) until the genus *Wiedomys* Hershkovitz, 1959b: 5, was erected for it. However, this species does not occur in Paraguay, and as Bertoni (1939) provides a locality for the species, he was applying this name incorrectly to some other species. Without any indication as to how he identified this species, it seems futile to speculate on its possible identity.

“54 *Oxymycterus rufus* (Desm.)”.
 “Puerto Bertoni”.

ID = QUAESTOR HOCICUDO *Oxymycterus quaestor* Thomas, 1903

M[us]. rufus G. Fischer, 1814: 71

Mus rufus A.G. Desmarest, 1819: 62

Oxymycterus G.R. Waterhouse, 1837: 21

Oxymycterus quaestor Thomas, 1903b: 226

Oxymycterus rufus (1914a)

Comments: *Mus rufus* G. Fischer, 1814, is based on the *Rat Cinquieme ou Rat Roux* of Azara (1801, 2: 94). Azara (1801) stated that the described specimen was sent to him by Nosedá in alcohol (which had dried and disfigured it), but did not clarify from where it came. The *Raton Hociudo* of Azara (1802, 2: 80) is clearly not the same individual, as the measurements differ and the type locality is given as 32.5°, a latitude well south of Paraguay. Azara (1802) did mention another specimen “captured by my friend Nosedá at the edge of a swamp and sent to me in alcohol”, adding that “it arrived disfigured ...” indicating that this was the same individual described as *Rat Roux* in Azara (1801). There are important differences in the descriptions of the two individuals, however, not least of which is the shape of the snout. If the specimens from these two distinct localities do indeed represent different species, then the *Raton Hociudo* is based on a composite (Contreras & Teta, 2003).

Contreras & Teta (2003) discussed the taxonomic history and type locality of *Oxymycterus rufus* (G. Fischer, 1814), concluding that the individual described by Azara (1801) as the *Rat Cinquieme ou Rat Roux* probably came from Misiones department, Paraguay (where Nosedá lived), and that the *Raton Hociudo* (Azara, 1802) was likely from Uruguay. However, there are no specimens of any *Oxymycterus* known from Misiones department. D’Elía *et al.*, (2008) provided a discussion of the nomenclatural implications and the potential for ongoing confusion due to historic and possible future misapplication of names. Oliveira & Gonçalves (2015) sought to eliminate some of this nomenclatural confusion by designating a neotype for *O. rufus*, which restricted the type locality of *Mus*

rufus G. Fischer, 1814, to Estancia San Juan Poriahú, Depto. San Miguel, Corrientes Province, Argentina (27° 43' 00" S, 57° 11' 38" W).

Bertoni (1939) provided the locality Puerto Bertoni for his listing, identifying it as *O. quaestor*; and there is in fact a specimen of this species from that locality in the NHM. Bertoni (1914a, 1939) may have applied the name *O. rufus* on the assumption that the Paraguayan specimen described in Azara (1802) was the same species as his specimen (Contreras & Teta, 2003). Yepes (1938) considered *O. rufus* of Bertoni (1914a) to refer to *O. misionalis* Sanborn, 1931: 1, but that name is now considered a junior synonym of *O. quaestor* Thomas, 1903b.

Bertoni's attribution of authorship of the name to Desmarest (1819) reflects the doubt at the time regarding the validity of the names in G. Fischer (1814).

"55 *Oxymycterus nasutus* Waterh".

"Capitán Meza. Anguyá pihtâ (*sensu stricto*). If my identification is correct, I believe this form to be only a subspecies of *O. rufus*".

ID = QUAESTOR HOCICUDO *Oxymycterus quaestor* Thomas, 1903

[*Mus*] *rufus* G. Fischer, 1814: 71

Mus nasutus G.R. Waterhouse, 1837: 16

Oxymycterus G.R. Waterhouse, 1837: 21

Oxymycterus quaestor Thomas, 1903b: 226

Oxymycterus nasutus (1914a)

Comments: Bertoni's belief that *Oxymycterus nasutus* (Waterhouse, 1837) may prove to be a subspecies of *Oxymycterus rufus* (G. Fischer, 1814), was later echoed by Cabrera (1961); however, both are now considered distinct species, and neither one is known to occur in Paraguay.

Yaguarasapá (= Capitán Meza), lies biogeographically within the Atlantic Forest ecoregion, which in Paraguay, is inhabited solely by *Oxymycterus quaestor* Thomas, 1903. This is indeed the only reddish *Oxymycterus* documented for Paraguay and is likely the species Bertoni (1939) had at hand. The statement that he considered his *O. nasutus* to be merely a subspecies of his *O. rufus* (= *O. quaestor*) further indicates that he found the two species to be extremely similar. Bertoni previously used similar phrasing when applying two or more names to distinct descriptions that later proved to be the same species, often after appearing to struggle to identify clear differences (Smith & Clay, 2021).

The argument for the potential presence of another reddish *Oxymycterus* (typically associated with *O. rufus*) in Misiones department, Paraguay, is based on the statement in the description of the *Rat Cinquieme ou Rat Roux* of Azara (1801, 2: 94), that the specimen was sent by Nosedá (who resided there; see Contreras & Teta, 2003). No additional specimens of *Oxymycterus* have been reported since from this area of Paraguay. Biogeographically, Misiones department consists largely of native grasslands known as Pastizales del Sur, which occur in transition to the Humid Chaco ecoregion (of Ñeembucú department). This is a completely different ecoregion than that found at Capitán Meza, an area historically dominated by Alto Paraná Atlantic Forest. Thus, it seems reasonable to assume that the species composition at Yaguarasapá would be closer to that of Puerto Bertoni than to that of Misiones department, and that Bertoni (1939) duplicated the taxon.

The Guaraní name *Anguyá pihtâ* means "red mouse", though it is not clear what Bertoni meant by *sensu stricto* in this case. Perhaps he believed this was the true *Anguyá*

pihtâ and intended to narrow the usage of a name that could be applied broadly to any red-coloured mouse. For example, see number 48 *Oryzomys angouya*.

“56 *Phyllotis auritus* (Desm.)”.

“([Footnote] 1) According to Trouessart (1897), *Mus callosus* of Rengger (1830) is a synonym of this species, but I have my doubts”.

ID = LARGE VESPER MOUSE *Calomys callosus* (Rengger, 1830)

M[us]. Auritus G. Fischer, 1814: 71

Mus auritus A.G. Desmarest, 1819: 64

Mus Callosus Rengger, 1830: 231

(*Calomys*) G.R Waterhouse, 1837: 21

(*Phyllotis*) G.R. Waterhouse, 1837: 28

Phyllotis auritus (1914a)

Comments: Bertoni’s footnote implies that he was following Trouessart’s (1897) nomenclature. However, the synonymization of these two names was actually first proposed by Burmeister (1859), who Trouessart (1897) listed in his bibliographical synonymy, and possibly indicating that Bertoni did not have access to the Burmeister reference. However, that *Mus callosus* Rengger, 1830, is not otherwise included in the *Catálogo* even though it has a Paraguayan type locality, suggests that this is the species intended.

Rengger (1830) stated that he collected the species on the banks of the Paraguay River roughly below 27° parallel. This general location was later restricted by Hershkovitz (1968: 172) to “opposite mouth of the Rio Bermejo, department of Villa de Pilar” and later emended to “vicinity of the City of Pilar, southwestern Paraguay” by Contreras (1992: 1), a locality in Ñeembucú department. Salazar-Bravo (2015: 488) misquoted this locality as “vicinity of the City of Pilar, Corrientes, Argentina”.

Desmarest’s *Mus auritus* is based on *Le Rat Quatrième ou Rat Oreillard* of Azara (1801, 2: 91) and is the species now known as *Reithrodon auritus* (G. Fischer, 1814), which does not occur in Paraguay. Azara (1801) noted that the specimen was collected by a day-labourer, had a stunted tail and large testicles and gave the source of the specimen as the “Pampas to the south of Buenos Aires”. Pardiñas *et al.*, (2015) restricted the type locality to Pila County, south side of the Río Salado, approximately 150 km S of Buenos Aires (see the following species).

“57 *Reithrodon typicus* Wath”.

“Misiones”

ID = NAKED-SOLED CONYRAT *Reithrodon typicus* G.R. Waterhouse, 1837

Reithrodon G.R. Waterhouse, 1837: 29

Reithrodon typicus G.R. Waterhouse, 1837: 30

Comments: This is the *Orejón* of Azara (1802, 2: 83), but apparently not the same individual and probably not the same species as *Le Rat Quatrième ou Rat Oreillard* of Azara (1801, 2: 91). There are significant differences between the two descriptions, including the mode of collection, the locality of collection, and in the total length and tail measurements provided

Azara (1802, 2: 83) stated that the *Orejón* was captured by a cat at 32.5° South (not 30.5° as given by Pardiñas *et al.*, 2007), and described it as having small testes, noting that it may not have been quite adult, and making no mention of a stunted tail. The collection locality puts it well south of modern-day Paraguay (probably within Uruguay), but also well to the north of the collection locality of *Le Rat Quatrième ou Rat Oreillard*. However, Azara (1802) does briefly mention capturing another at 36° with a truncated tail, apparently in reference to the same individual described in Azara (1801). A third individual from north of the river Plata had slightly larger measurements.

Based on these localities, the *Orejón* of Azara (1802) appears to be composite. Both the individual described and the specimen from north of the Plata River fall within the range of *Reithrodon typicus* Waterhouse, 1837, with type locality Maldonado, Uruguay. The individual from “36° with the truncated tail” is from south of the Plata River and apparently is the same individual that formed the basis of the *Rat Quatrième ou Rat Oreillard* upon which the name *Reithrodon auritus* (G. Fischer, 1814) is based.

No member of the genus *Reithrodon* Waterhouse, 1837, occurs in either Paraguay or Misiones, Argentina (Pardiñas *et al.*, 2015); the listing by Bertoni (1939) is an error.

“Family Octodontidae”

Comments on composition of Octodontidae: Bertoni’s Octodontidae contained members of two families under current taxonomy: Ctenomyidae (58) and Echimyidae (59–64), although the Coypu (63) is sometimes included in its own family, Myocastoridae (Landry, 1957). This same taxonomy was used by Lahille (1899) and Trouessart (1897, 1905), but Lahille’s generic assignments differ slightly from the latter work.

“58 *Ctenomys dorsalis* Thos”.

“Anguya–ihvighwih – Inhabits only the fields of the south and the Chaco”.

ID = Composite of *Ctenomys* sp.

Ctenomys Blainville, 1826: 64

Ctenomys Brasiliensis Blainville, 1826: 64

Ctenomys dorsalis Thomas, 1900a: 385

Ctenomys brasiliensis (1914a)

Comments: This is, in part, the *Tucotuco* of Azara (1802, 2: 69), but the distribution given in that description (Paraguay to the pampas of Buenos Aires) encompasses the range of numerous species. The local name *Anguya–ihvighwih* means burrowing rat.

At the time of the *Catálogos*, *Ctenomys dorsalis*, with type locality “northern Chaco of Paraguay”, was the only species of Paraguayan Tuco–tuco that had been described. Long known only from a single, lost skin from the Paraguayan Chaco considered unique because of its dark vertebral line (Contreras & Roig, 1992). Londoño–Gaviria *et al.*, (2019) reported on a series of rediscovered specimens, but the species has not been seen alive since it was last collected in the 1940s. It is of note that the words “and the Chaco” were added to the distribution for this species by Bertoni (1939), but did not appear in Bertoni (1914a), indicating that he was unaware of the existence of *C. dorsalis* when preparing the first edition of the *Catálogos*. This addendum clearly refers to *C. dorsalis*, as the most widespread species in the Paraguayan Chaco, *C. conoveri* Osgood, 1946: 47, was not described until later. Neither *C. dorsalis* nor *C. conoveri* form part of the *Tucotuco* of Azara (1802).

The second part of the distribution “campos del sur” is surely derived from Azara (1802) who used similar phrasing. Similarly, the name *Ctenomys brasiliensis* Blainville, 1826 in Bertoni (1914a) is also related to Azara (1802) by way of Lahille (1899) who considered it the name applicable to the *Tucotuco* of Azara. This is despite Blainville’s (1826) assertion that Azara’s description was not consistent with his new species. Trouessart (1897) also used this name for Paraguayan *Ctenomys*, but did not reference Azara. However, *C. brasiliensis* does not occur in Paraguay and, indeed under the current concept of the species, it is not distributed within the geographic area covered by Azara’s work (1802; see Bidau, 2015). Two endemic species of *Ctenomys* are known from the southern grasslands of Paraguay: *C. pilarensis* Contreras, 1993: 44 in southwestern Ñeembucú department; and *C. paraguayensis* Contreras, 2000: 62, confined to Coraté-i near Ayolas, Itapúa department. These two species were not recognized until more than half a century after the publication of the 1939 *Catálogos*, and it would seem that Bertoni was unaware of them (though Azara may have been).

Bertoni appears to have used the name *C. dorsalis* Thomas, 1900a, to unwittingly refer to a composite of Paraguayan *Ctenomys* because he believed it was the only species occurring in Paraguay.

“59 *Dactylomys amblyonyx* Wagn”.

“Puerto Bertoni. Paraguay!”

ID = ATLANTIC FOREST BAMBOO RAT *Kannabateomys amblyonyx* (Wagner, 1845)

Dactylomys Wagner, 1845: 146

Dactylomys amblyonyx Wagner, 1845: 146

Kannabateomys Jentink, 1891: 109

Dactylomys amblyonyx H. von Ihering, 1892a: 110

Dactylomys A. de W. Bertoni, 1914a: 73

Dactylomys amblyonyx (1914a)

Comments: Owen *et al.*, (2018) did not list Puerto Bertoni as a locality, even though they reported significant additional Paraguayan records for this species. *Kannabateomys amblyonyx pallidior* Thomas, 1903a: 489, was based on a Paraguayan specimen (original number 886) from Sapucay, collected by William Foster. Thomas based his description on pelage colour differences between Paraguayan and Brazilian specimens. Those differences are consistent in the most recent Paraguayan specimen reported by Owen *et al.*, 2018. Nevertheless, Emmons *et al.*, (2015) treated the species as monotypic.

“60 *Echymys longicaudatus* Rengger”

“Central Paraguay. Probably a variety of *E. cayennensis*”.

ID = LONG-TAILED SPINY RAT *Proechimys longicaudatus* (Rengger, 1830)

Proechimys J.A. Allen, 1899: 264

Echymys Longicaudatus Rengger, 1830: 236

Echymys: A. de W. Bertoni, 1914a: 73

Echymys longicaudatus (1914a)

Comments: Thomas (1904: 240) stated that “Rengger’s type was obtained on the 21st parallel of latitude; therefore, not far south of Corumbá”. However, this is to misquote Rengger (1830: 236), who in fact wrote: “The wild guaranies, who live in Paraguay below

the one and twentieth parallel, brought me a second genus of spiny rats during my stay among them in 1821" [my emphasis]. Corumbá lies close to the 19th parallel, so Rengger's locality is considerably farther south.

During 1821, Rengger is known to have travelled to the Misiones region of southern Paraguay from 28 March to 14 June, and to the "Yerbales de la Cordillera de Maracayu pasando por Villa Real [= Concepción] hasta Cerro Pyta [= Canindeyú department]" from 22 October to 22 December (Ramella & Perret, 2011: 428). The type locality of the species is more likely to be within the geographical area of the latter trip in the northern Oriental region. This is more consistent with Bertoni's concept of Paraguay Central than is northern Paraguay, which is the current type locality.

Bertoni misspelled *Echimys* F. Cuvier, 1809a: 394, though the name was correctly spelled by Rengger (1830) and Trouessart (1897). Bertoni wrote that it is "probably a variety of *E. cayennensis*", but that species, now known as *Proechimys guyannensis* (É. Geoffroy St.-Hilaire, 1803: 194), is distributed well north of Paraguay, north of the Amazon River.

Comments on echimyids (61–62): A complex nomenclatural history precedes the generic names used for the next two species and this was first addressed by J.A. Allen (1899). Allen attempted to fix type species for *Loncheres* Illiger, 1811, and *Echimys* F. Cuvier, 1809a, and thus keep both names valid. However, Trouessart (1904) and Tate (1935) later synonymized *Loncheres* under *Echimys*.

Bertoni's (1939) arrangement follows neither of these important works, and most clearly resembles the usage by Trouessart (1897), an arrangement already out of date in 1939.

"61 *Loncheres cristatus* (E. Geoff)".

"Paraguay (Trouessart 1897)"

ID = UNIDENTIFIABLE

Loncheres Illiger, 1815: 108.

Echimys cristatus A.G. Desmarest, 1817: 55

Loncheres cristatus (1914a)

Comments: Bertoni (1939) listed "Paraguay (Trouesart)" [sic] after the species name, indicating that Trouessart (1897), who listed Paraguay as part of the distribution, was the source. That Trouessart (1904) later included *Loncheres* in *Echimys*, confirms that the 1897 publication was intended. The inclusion of this name in the *Catálogos* without apparently knowing what species it referred to is another example of Bertoni's confidence in the opinion of respected colleagues.

Trouessart (1897: 604) gave the distribution of *Loncheres cristatus* as "America merid., Guiana (Cayenne, Surinam, Venezuela (Caracas), Paraguay, Brasil, Para, Nov.–Fribourg", confirming that Trouessart's *Loncheres cristatus* was composite. *Loncheres cristatus* (Desmarest, 1817) is now considered a junior synonym of *Echimys chrysurus* (Zimmerman, 1780: 352), which does not occur in Paraguay, and is not a synonym of *Loncheres cristatus sensu* Trouessart (1897) or *sensu* Bertoni (1939). There is no indication that Bertoni (1939) was aware of what species he intended with the name *Loncheres cristatus*, and thus it must be considered unidentifiable.

“62 *Mesomys spinosus* (E. Geoff)”.

“Puerto Bertoni, Yaguarasapá, Central Paraguay. Common. Should also be present on the Argentine side of the Paraná”.

ID = GUIARA SPINY RAT *Euryzygomatomys spinosus* (G. Fischer, 1814)

Rattus spinosus G. Fischer, 1814: 105

Echimys spinosus A.G. Desmarest, 1817a: 57

Mesomys Burmeister, 1854 205; not of Wagner, 1845: 145

Euryzygomatomys Goeldi, 1901: 179

Mesomys spinosus (1914a)

Comments: This is the *Raton Espinoso* of Azara (1802, 2: 76). The name *Rattus spinosus* G. Fischer, 1814, is based on *Rat Épineux* of Azara (1801, 2: 73). Goeldi (1901) designated *Echimys spinosus* Rengger, 1830 (= *Rattus spinosus* G. Fischer, 1814), as the type species of his genus *Euryzygomatomys*.

Echimys spinosus was also based on Azara (1801) and derived from a name in an unpublished manuscript by É. Geoffroy St.-Hilaire written in 1808 or 1809 (J.A. Allen, 1899), and explains the attribution to Geoffroy St.-Hilaire by Bertoni (1939). Burmeister (1854) incorrectly referred this species to the genus *Mesomys* Wagner, 1845, assuming that the type species *M. ecaudatus* Wagner, 1845: 145 (= *M. hispidus* [Desmarest, 1817a: 58]) was based on a tailless specimen of *E. spinosus*; this interpretation was followed by Trouessart (1897), which seems to have been Bertoni's source.

Consequently, *Mesomys spinosus sensu* Bertoni (1939) is referable to *Euryzygomatomys spinosus* (G. Fischer, 1814). Bertoni (1939) stated that the species was common at Puerto Bertoni and probably also on the Argentine side of the Paraná. *Euryzygomatomys spinosus* is one of only two echimyids known from the Atlantic Forest of Paraguay where it is still common. The other is the completely dissimilar *Kannabateomys amblyonyx*. Both species are also the only members of the family known from Misiones province, Argentina (Chebez, 1996).

“63 *Myocastor coypus* (Mol.)”.

“Kihyá”.

ID = COYPU *Myocastor coypus* (Molina, 1782)

Mus Coypus Molina, 1782: 287

Myocastor Kerr, 1792: 225

Myocastor coypus (1914a)

Comments: This is the *Quiyá* of Azara (1802, 2: 1) and *le Quouiya* of Azara (1801, 1: 5). The priority of the generic name *Myocastor* Kerr, 1792, for this taxon was explained by J.A. Allen (1895). The *Myocastorinae* Ameghino, 1902, are solidly nested within the *Echimyidae* according to molecular data (Leite & Patton, 2002; Carvalho & Salles, 2004; Galewski *et al.*, 2005; Upham & Patterson, 2012).

“64 *Trichomys fosteri* Thos”.

“Sapucay”.

“([Footnote] 2) I haven't yet found *Trichomys* in Paraguay, but I saw a specimen from Sapucay identified with this name in the collection of Mr. Foster”.

ID = FOSTER'S PUNARÉ *Thrichomys fosteri* Thomas 1903b

Thrichomys Trouessart, 1880: 179

Thrichomys Fosteri Thomas, 1903b: 227

Trichomys: Miranda-Ribeiro, 1914: 42

Thrichomys fosteri (1914a)

Comments: The generic spelling consistently used by Bertoni (1914a, 1939) is that of Miranda-Ribeiro (1914). The correct spelling is *Thrichomys* Trouessart, 1880, although Trouessart (1897: 606) later used the spelling *Thricomys*, and again changed the spelling to *Tricomys* in 1905 (p. 504) with the explanation that the changed spelling was required by rules of grammar. The phrasing of Bertoni's footnote suggests he did not personally identify the specimen he saw.

Thrichomys fosteri Thomas, 1903a, was based on a series of four specimens (Holotype, original number 851) collected "among tumbled rocks" on 2 September 1902 at Sapucay, by Guillermo Foster and the species is named in his honour. William ("Guillermo") Foster (5 April 1873—17 March 1915) was born in London and arrived in Paraguay in 1894. From his base in Sapucay, he became the most prolific Paraguayan collector for museums in Europe and the United States at the turn of the 20th Century. He was a founder of the Museo de Historia Natural de la Escuela Normal de Asunción, but died prematurely from a heart attack (Robebar, 1930). *Thrichomys fosteri* was long considered a synonym of *T. pachyurus* (Wagner, 1845: 146), but was recently recognized as a separate species by D'Elia & Myers (2014).

Speculation on the common name Kui, Qui and variations: The Guaraní names for the coypu *Quiyá* and the porcupine *Kui-î* seem both to have the same grammatical root. I have been unable to find any published explanation for the meaning of the names other than the statement by Azara (1802) that *Quiyá* means lord of the lice, purportedly because of the exaggerated parasite loads of the species. However, I find this explanation less than convincing, not least because Coypu do not habitually show particularly high ectoparasite loads (Martino *et al.*, 2018). I speculate that the term *Qui* and *Kui* are in reference to a large rodent and that its origin is probably onomatopoeic (Jorge Ayala pers. comm.). *Quiyá* is thus a contraction of *Qui jara*, meaning lord of the Quis or biggest of the Quis, and *Kui-î* is its opposite, meaning smaller of the quis – separation based on size being a common practice in Guaraní animal names. This name may have survived into the Spanish language as a common name for cavies (*cuis*) in some countries, although in Paraguay the common name *aperea* is used for these animals.

Comment on the remaining hystricomorph rodents: For the remaining hystricomorph rodents in the *Catálogo*, Bertoni does not appear to have relied on Trouessart (1897) for identifications.

"Family Hystricidae"

"65 *Coendu villosus* (F. Cuv.)".

"Kui-î. Very scarce on the banks of the Paraná River. I have collected specimens in Puerto Bertoni and Santa Ana – Argentina! My brother Tell Bertoni kept one captive for many months and confirmed all the details of the observations made by Azara (1802)".

ID = PARAGUAYAN HAIRY DWARF PORCUPINE *Coendou spinosus* (F. Cuvier, 1823)

Coendou Lacépède, 1799: 11

S[phiggure]. *Spinosa* F. Cuvier, 1823a: 433

S[phiggure]. *Villosa* F. Cuvier, 1823a: 434

sphiggurus F. Cuvier, 1823b: 256

Sphiggurus villosus (1914a)

Comments: This is the *Cuiy* of Azara (1802, 2: 55) and *le Couiy* of Azara (1801, 1: 105). The generic nomenclature of Neotropical porcupines has been reviewed by Tate (1935), Alberico *et al.*, (1999), and Voss (2011). Voss (2011) discussed the genetic evidence placing *Sphiggurus* F. Cuvier, 1823b, within *Coendou* Lacépède, 1799.

The only species of porcupine present along the Paraná River is *Coendou spinosus*, of which *C. villosus* is a junior synonym (Voss, 2011). Voss (2011) fixed the identity of *C. spinosus* by designating a specimen (USNM 115122) from Sapucay, collected by William Foster as the neotype. Members of this genus are now included in the family Erethizontidae.

“Family Dasypsectidae”

“66 *Coelogenys paca* (L.)”.

“Pág. Akutí-páih. Still exists throughout Alto Paraná. Paraná, Argentina, Paraguay”.

ID = LOWLAND PACA *Cuniculus paca* (Linnaeus, 1766)

Cuniculus Brisson, 1762: 98.

[*Mus*] *Paca* Linnaeus, 1766: 81

Coelogenys Illiger, 1811: 92

Coelogenys paca (1914a)

Comments: This is the *Paí* of Azara (1802, 2: 14) and *le Pay* of Azara (1801, 2: 20), a name which Azara stated was given to it by the Guaraní. The common name *Akutipak* is more commonly used in modern day Paraguay. The species is now classified in the family Cuniculidae, but frequently has been treated as a subfamily of either Dasypsectidae (Simpson 1945) or Agoutidae (McKenna & Bell, 1997).

The continued use of the generic name *Coelogenys* Illiger, 1811, by authors at the turn of the 20th Century was argued for by Thomas (1914), who vouched for its retention over alternatives with priority – *Cuniculus* Brisson, 1762 and *Agouti* Lacépède, 1799: 9, – but this was rejected by ICZN (1925). McKenna & Bell (1997) argued for the preferential use of *Agouti* on the basis that Brisson (1762) was non-binomial. Nevertheless, some of Brisson’s mammal names were made available by the IZCN (1998) through its plenary powers, making *Cuniculus* Brisson, 1762, the valid generic name.

Comments on Agoutis (67–68): Only one species of *Dasypsecta azarae* (Lichtenstein, 1823) is documented as occurring in Paraguay (Teta & Lucero, 2016; de la Sancha *et al.*, 2017). A great number of taxa have been described as a result of the great variation shown by this species. However, Thomas (1904) was unable to equate variation with geography and noted that specimens from any one locality (specifically mentioning Paraguay) were highly variable. *Dasypsecta azarae* is provisionally considered monotypic as it is premature to recognize any additional taxa based on current knowledge (Patton & Emmons, 2015). This is the *Acutí* of Azara (1802, 2: 21) and *l’Acouti* of Azara (1801, 2: 26).

“67 *Dasyprocta aguti azarae* (Licht.)”.

“Akutí. Very common throughout Paraguay and Misiones, Argentina, east of the Paraná. In our region I am familiar with two forms. I suspect that more than one of the northern “species” should be demoted to the category of variety”.

ID = AZARA’S AGOUTI *Dasyprocta azarae* (H. Lichtenstein, 1823)

[Mus] *Aguti* Linnaeus, 1766: 80

Dasyprocta Illiger, 1811: 93

Dasyprocta Azarae H. Lichtenstein, 1823: 3

Dasyprocta aguti azarae (1914a)

“68 *Dasyprocta caudata* Lund”.

“Puerto Bertoni”.

ID = AZARA’S AGOUTI *Dasyprocta azarae* (H. Lichtenstein, 1823)

Dasyprocta Illiger, 1811: 93

Dasyprocta Azarae H. Lichtenstein, 1823: 3

Dasyprocta caudata Lund, 1840b: 12

Comments: *Dasyprocta caudata* is now considered a junior synonym of *D. azarae*.

“Family Caviidae”

Comments on Cavies (69–71): Bertoni (1939) reported two species (three taxa in all) of cavy. However, all of these names refer to the same species *Cavia aperea* Erxleben, 1777, the only species of cavy that occurs in the Oriental region of Paraguay (de la Sancha *et al.*, 2017). This is the *Apereá* of Azara (1801, 2: 65; 1802, 2: 37), but the scientific name predates that description and has type locality of Brasiliae, restricted to Pernambuco, Brazil, by Cabrera (1961). Azara (1802) stated that the name *Apereá* means here you fall “*aqui te caes*”.

Bertoni (1939) listed two subspecies of *Cavia porcellus* (Linnaeus, 1758), which Lahille (1899) considered to be the name applicable to the *Apereá* of Azara (1802). Lahille (1899) also recognized *C. leucopyga* Brandt, 1825, in the Argentine fauna, providing an identical distribution for it as for *C. porcellus*, but no information on diagnostic traits. Trouessart (1897), on the other hand, treated *Cavia aperea sensu* Rengger, 1830: 275, as a synonym of *Cavia leucopyga* Brandt, 1835. Rengger (1830) stated that he had seen *Der Aperea* throughout Paraguay and in Brazil (in Bahia and Pernambuco). He detailed his observed differences between it and the “guinea-pig” (presumably *C. porcellus*), including failed attempts to induce the two to mate. Bertoni’s (1939) usage of both names for the Paraguayan fauna thus had precedent. Their treatment as subspecies was perhaps influenced by a statement in von Ihering (1894: 21) noting, in reference to *C. aperea* and *C. leucopyga* that Natterer and Pelzeln distinguish two species in samples from Ypanema but he doubted that they were correct.

“69 *Cavia porcellus aperea* Erxl”.

“Apereá – Yaguarasapá”

ID = PAMPAS CAVY *Cavia aperea* Erxleben, 1777

[Mus] *Porcellus* Linnaeus, 1758: 59

Cavia Pallas, 1766: 30

[*Cavia*] *Aperea* Erxleben, 1777: 348

Cavia porcellus aperea (1914a)

“70 *Cavia porcellus leucopyga* Bradt”.

“Apereá – Puerto Bertoni”.

ID = PAMPAS CAVY *Cavia aperea* Erxleben, 1777

Cavia Pallas, 1766: 30.

[*Mus*] *Porcellus* Linnaeus, 1758: 59

[*Cavia*] *Aperea* Erxleben, 1777: 348

Cavia leucopyga Brandt, 1835: 436

Cavia porcellus leucopyga (1914a)

“71 *Cavia spixi* Wagl”.

“Apereá morotí – Villa Azara – Paraguay!”

ID = PAMPAS CAVY *Cavia aperea* Erxleben, 1777

Cavia Pallas, 1766: 30

[*Cavia*] *Aperea* Erxleben, 1777: 348

Cavia Spixii Wagler, 1831a: 512

Cavia spixi (1914a)

Comments: *Apereá morotí* means white cavy, but I have been unable to find any other uses of that name in the literature. The locality Bertoni reported for this species, Villa Azara, is in Alto Paraná department, and no association with Azara’s texts was intended. The only cavy species that occurs in this area is *Cavia aperea*.

Osgood (1915a: 197) commented on the confusion surrounding the early usage of the name “*Cavia spixi* [sic]”, stating that the name had been “applied invariably ... to the species of the arid interior *catinga* [sic] districts of northeastern Brazil in the states of Bahia and Ceara”. He went on to include *Cavia spixii* in the subgenus *Galea* Osgood, 1915a, which is now recognized at the generic level. However, *Galea spixii* Wagler, 1831 does not occur in Paraguay. The only member of the genus present in Paraguay is *Galea leucoblephara* (Burmeister, 1861), which is confined to the Chaco (an area with which Bertoni was unfamiliar; see de la Sancha *et al.*, 2017).

“72 *Hydrochoerus hydrochoerus* (L.)”.

“Kapiihvá”.

ID = CAPYBARA *Hydrochoerus hydrochaeris* (Linnaeus, 1766) (Figure 8)

Hydrochoerus Brisson, 1762: 80

[*Sus*] *Hydrochaeris* Linnaeus, 1766: 103

Sus Hydrochoerus Zimmerman, 1777: 552

Hydrochoerus hydrochoerus (1914a)

Comments: This is the *Capibara o Capigüara* of Azara (1802, 2: 8) and *le Capiygoua* of Azara (1801, 2: 12). The Guaraní name *Capigüara* (from which the English common name is derived) means “the one who eats slender leaves”, or “grass eater”. The species is most commonly referred to as *Carpincho* in modern Paraguay. The misspelling of the species name so that it is identical with the generic name is a common and repeated error by multiple researchers.



Figure 8. *Capybara Hydrochoerus hydrochaeris*, Río Negro, Alto Paraguay department. (Photo: Paul Smith).

“Family Leporidae”

“73 *Lepus brasiliensis* (Briss.)”.

“Tapiti”.

ID = TAPITI COTTONTAIL *Sylvilagus* sp. (Linnaeus, 1758)

Lepus Linnaeus, 1758: 57

[*Lepus*] *brasiliensis* Linnaeus, 1758: 58

Sylvilagus J.E. Gray, 1867: 221

Lepus brasiliensis (1914a)

Comments: This is the *Tapiti* of Azara (1802, 2: 32) and *le Tapiti* of Azara (1801, 2: 57). *Tapiti* is the local name for a rabbit. Use of *Lepus* was based on von Ihering (1892; 1894) and Lahille (1899).

The specific identity and correct name applicable to the *Sylvilagus* present in Paraguay has not been clarified, however the name traditionally applied in the literature, *S. brasiliensis* (Linnaeus, 1758) is definitely not correct as that taxon ranges north of the Amazon (Ruedas *et al.*, 2017). Ruedas *et al.*, (2017) note that two names are available for populations south of the Amazon, *S. minensis* Thomas, 1901e: 535 (from Rio Jordão and Lagoa Santa) and *S. paraguensis* Thomas, 1901e: 549 (type locality: Sapucay, E of Asunción, Paraguay). Ruedas *et al.*, (2017: 53) state that these are unlikely to represent the same biological species, but recommend the usage of *S. minensis* “*pro tempore*, while further studies are being undertaken”. However, should these two indeed prove to be distinct the name *S. paraguensis*, which has a Paraguayan type, may be applicable. I prefer to await the results of studies underway before assigning Paraguayan populations to species.

“74 *Lagostomus maximus* (Blainv.)”.

“Viscacha, “Bolivian rabbit”. Extends widely through the Paraguayan Chaco. (Caballero collector)”.

ID = PLAINS VIZCACHA *Lagostomus maximus* (A.G. Desmarest, 1817b)

Dipus maximus A.G. Desmarest, 1817b: 117

Lagostomus Brookes, 1829: 96

Comments: This is the *Vizcacha* of Azara (1802, 2: 45) and *le Lièvre pampa* of Azara (1801, 2: 51), though he stated that the species does not occur in Paraguay.

Bertoni (1939) includes this species in Leporidae, but it is now included in Chinchillidae. The reason for its placement in Leporidae is confusing, but it perhaps has its root in a curious misprint in Lahille (1899: 193) where the family heading for Leporidae is duplicated (it is in the correct place on p. 195) and this is the next species listed (on the following page). Removal of this duplicated heading would place the species, correctly, in Lagostomidae. That the duplication in Lahille is an error is clear both from the fact that the heading is in exactly the same place on p. 193 as on p. 195, and the fact that Lahille (1906) revived the use of the generic name *Lagostomus* Brookes, 1829, for this species in his revision of the nomenclature of Vizcachas. Lahille (1899) was clearly a source that Bertoni consulted for rodent taxonomy and I have been unable to find any other instance where a modern author treated this species as a Lagomorph.

The comment that the species “extends widely” through the Chaco is not consistent with the known distribution, which is the most arid area of the Dry Chaco in extreme western Boquerón department and a small area in the departments of Tarija and Santa Cruz of adjacent Bolivia. A persistent rumour exists that this restricted distribution is the result of a deliberate introduction for game purposes (Julio Rafael Contreras, pers. comm.), but the species has apparently undergone a considerable range contraction since the Pleistocene and the current distribution may be a relict of a much wider distribution. This range reduction is due to long term natural processes and not a sudden range restriction as may be inferred from Bertoni’s statement. Bertoni’s claim that the species was widespread throughout the Chaco is further evidence of his overall unfamiliarity with the Chaco fauna.

“Order V CARNIVORES”

“Family Felidae”

Comments on Felidae (75–83): One of the principal sources for Bertoni’s nomenclature for the Felidae seems to have been von Ihering (1910), as several nomenclatural peculiarities are common to both works. The Guaraní common names *Mbarakayá* and *Chivi* mean cat, the latter usually attributed to spotted cats.

“75 *Felis concolor* L”.

“Guasuára, Yaguá pihtâ”.

ID = PUMA *Puma concolor* (Linnaeus, 1771)

Felis Linnaeus, 1758: 41

[*Felis*] *concolor* Linnaeus, 1771: 522

Puma Jardine, 1834: 266

Felis concolor (1914a)

Comments: This is the *Güazúará* of Azara (1802, 1: 120) and *le Gouazouara* of Azara (1801, 1: 133). The name used by Azara was attributed to the “older Guaraní” and is rarely heard in modern day Paraguay. The Guaraní name *Yaguá pihtâ* roughly translates to red dog or red predator. Inclusion in the genus *Puma* Jardine, 1834, was by Pocock (1917), Weigel (1961), Hemmer (1978), and Kratochvil (1982).

Comments on the Jaguarundi (76–77): As noted by Bertoni (1939) these refer to different colour forms of a single species, *Felis eyra* G. Fischer, 1814, for the red form and *Felis yaguarundi* É. Geoffroy St-Hilaire, 1803, for the black form. Both names are based to some degree on de Azara’s (1801) *l’Eyra* (entirely in 1: 177) and *l’Yagouaroundi* (partially in 1: 171) respectively. Hershkovitz (1951) restricted the type locality of the latter to “Cayenne, French Guiana” because the description was also based on specimens from that locality. The derivation of the name jaguarundi and its variations is from the Guaraní: *yagua* predator (though now commonly understood to mean dog) and *undi* dark.

The jaguarundi was placed in the monotypic genus *Herpailurus* Severtzov, 1858: 385, by Hemmer (1978), Weigel (1981) and Kratchovíl (1982), but *Herpailurus* was later included as a subgenus of *Felis* Linnaeus, 1758, by McKenna & Bell (1997). However, genetically the jaguarundi was shown to be related to *Puma* Jardine, 1834 by Salles (1992), Johnson & O’Brien (1997), Bininda-Emonds *et al.*, (1999), and Mattern & McLennan (2000). Kitchener *et al.*, (2017) noted that inclusion in *Puma* was possibly correct, but suggested retention in *Herpailurus* pending further data and I follow that here.

“76 *Felis eyra* Fisch”.

“Mbarakayá–eirá pihtâ, Yaguarundih pihtâ. A specimen, killed in the water at the latitude of Yguazú, shows that it is just a variety of number 77, representing a rufous phase that is also present in the Coati. I share the opinion of Winge. *Felis ameghinoi* Holmberg, 1898 is also this form, as described by Azara”.

ID = JAGUARUNDI *Herpailurus yagouaroundi* (É. Geoffroy St-Hilaire, 1803)

Felis Linnaeus, 1758: 41

Felis yagouaroundi É. Geoffroy St-Hilaire, 1803: 124

[*Felis*] *Eyra* G. Fischer, 1814: 228

Herpailurus Severtzow, 1858: 385, 390

Felis Ameghinoi Holmberg, 1898: 485

Felis eyra (1914a)

F[elis]. *Eyra* (1925c)

Comments: This is the *Eirá* of Azara (1802, 1: 159) and *l’Eyra* of Azara (1801, 1: 177). Bertoni (1939) adopted the taxonomy used by von Ihering (1910) for *Felis eyra*, but corrected von Ihering’s “*Felis eira*” to the original spelling used by G. Fischer (1814), which is based on Azara (1801).

“77 *Felis yaguarundi* Fisch”.

“Mbarakayá–eirá (South), Akutí–yaguá (East), Yaguarundih (Central Paraguay). Not as rare as the rufous variety in Puerto Bertoni, Tacurú–pucú”.

ID = JAGUARUNDI *Herpailurus yagouaroundi* (É. Geoffroy St-Hilaire, 1803)

Felis Linnaeus, 1758: 41

Felis yagouaroundi É. Geoffroy St-Hilaire, 1803: 124

Felis yaguarondi: Lacépède, 1809: pl. 10

[*Felis*] *Yaugouroundi*: G. Fischer, 1814: 228
Herpailurus Severtzow, 1858: 385, 390
Catopuma Severtzow, 1858: 387, 390
Felis (*Catopuma*) *yaguarundi*: Lahille, 1899: 179
Catopuma yuguarundi: A. de W. Bertoni, 1932: 104
Felis yaguarundi (1914a)
F[elis]. yaguarundi (1925c)
Catopuma yuguarundi (1932)

Comments: This is the *Yagüarundí* of Azara (1802, 1: 156) and *l'Yagouaroundi* of Azara (1801, 1: 171). The valid scientific name is based on the latter description. Though *Felis yagouaroundi* has been ruled available, debate over the availability of new taxa in É. Geoffroy St. Hilaire (1803) has resulted in the specific name appearing with numerous different spellings in the scientific literature, and many earlier authors preferentially used *Felis yaguarondi* Lacépède, 1809. Though Bertoni (1939) attributed his spelling *yaguarundi* to G. Fischer (1814), this is incorrect as G. Fischer spelled the name *Yaugouroundi*. The attribution to Fischer follows von Ihering (1910) who spelled the name *yuaguarundi*. The spelling *yaguarundi* first appeared in Lahille (1899), which may have been Bertoni's source for the scientific name. Lahille (1899) attributed the scientific name erroneously to Azara.

"78 *Felis bracata* Cope".

"Río Paraguay. I now consider the following diagnosis to be a melanistic form of this species: *Felis melas* W. Bertoni (nec. Perón) – Mbarakayá-hû, Chivi-hû (Alto Mondaíh) Size of *Leopardus tigrinus*. All of the back and loins uniformly black, the sides of the body and legs, the rump and tail, coffee-coloured with oval or rounded black spots. Throat and breast pale chestnut with spots not as black as on the sides; abdomen uniformly pale chestnut. The specimen was brought to me already prepared from Alto Mondaíh, in order for me to describe it. I believed for a long time that this was a case of melanism, but now that I am familiar with the melanistic forms of the other species I have changed my opinion. It seems to be a curious type of incomplete melanism that I have not seen described in South America. In the other species the melanism is total, with the base-colour less intense so that the pattern of the species is visible. This specimen however has no pattern on the back".

ID = UNIDENTIFIABLE

Felis Linnaeus, 1758: 41
Leopardus J.E. Gray, 1842: 260
Catopuma Severtzow, 1858: 387, 390
Felis braccata Cope, 1899: 144
Felis melas A. de W. Bertoni, 1914a: 75
Felis bracata J.A. Allen, 1916a: 560
Felis melas (1914a)
Felis (*Catopuma*) *bracata* (1925c)

Comments: *Felis melas* Bertoni, 1914a, is a *nomen dubium*. The description is not identifiable, and there is an incoherency between Bertoni (1914a), where he claims the specimen is definitely not melanic as he knows all the melanic forms, and Bertoni (1939) where he claimed it is melanic after all. Identification as the Pantanal cat *Leopardus braccatus* (Cope, 1899) is also questionable as it does not mention any characteristic

associated with the species that would still be visible in a melanic specimen, for example the noticeably longer fur, while the habitat in the Alto Mondaih region of Alto Paraná department is largely Atlantic Forest where this open-country species is not known to occur. Nor is there any solid basis for its inclusion in the synonymy of Geoffroy's cat *Leopardus geoffroyi* (d'Orbigny & Gervais, 1844) by Oliveira do Nascimento (2014) other than the vague reference to oval or rounded spots.

Bertoni (1939) added (nec. Perón) to the text, not present in Bertoni (1914a). *Felis melas* G. Cuvier, 1809b: 152, was discovered by François Peron and has its type locality "Java". It is the melanistic morph of the leopard *Panthera pardus* commonly known as black panther; thus, *Felis melas* Bertoni is preoccupied by *Felis melas* Cuvier.

"79 *Panthera onca paraguayensis* Allen".

"Yaguá-pará, Yaguareté, Yavukú (East); Yaguá pini (Brazil). I have only seen two cases of melanism in Paraguay".

ID = JAGUAR *Panthera onca* (Linnaeus, 1758)

Felis Linnaeus, 1758: 41

[*Felis*] *Onca* Linnaeus, 1758: 42

Panthera Oken, 1816: 1052

Felis onssa H. von Ihering, 1910: 169

Felis onssa (1914a)

Comments: This is the *Yagüareté* of Azara (1802, 1: 91), with the melanistic phase being described separately as the *Yagüareté negro* (1802, 1: 114). The former is *l'Yagouarété* of Azara (1801, 1: 114). *Yaguá-pará* means spotted predator and *Yaguareté* means the epitome of a predator or the true predator. The latter name is the most widely used in Paraguay today.

The southernmost subspecies of the jaguar are variably attributed to *P. o. palustris* (Ameghino, 1888: 6; see Pocock, 1939) or to *P. o. paraguensis* (Hollister, 1914: 169). Seymour (1989) noted that, as the former is based on a fossil, it should probably not be recognized and most recent authors have followed that arrangement, though the name clearly has priority (Code of Zoological Nomenclature, 1999). Jaguar subspecies have been defined largely on cranial characters, but Larson (1997) failed to find any consistent differences between named subspecies and recommended that the species be treated as monotypic and this was followed by Kitchener *et al.*, (2017).

Panthera paraguayensis Oken, 1816: 1052, refers to the ocelot (which is described at length) and includes the 'Chibi-guazu' of Azara. J.A. Allen (1902) erred in associating the *Chibi-guazu* with the margay, so *Panthera paraguayensis* Oken, 1816 is a pure and unavailable synonym of *Felis pardalis* Linnaeus, 1758, but *Panthera paraguayensis* Allen, 1902 is a misapplication of that name, but an available synonym of *Felis wiedii* Schinz, 1821. Bertoni (1939) probably used the combination *Panthera onca paraguayensis* Allen (a margay) in error, misapplying it because of confusion with the similarly-named *Felis paraguensis* Hollister, 1914 (a jaguar).

Most of Oken's (1816) names are unavailable (ICZN, 1956). However, the generic name *Panthera* Oken, 1816, was made available through the plenary powers of the ICZN resulting from a petition to the Commission by Corbet *et al.*, (1974). The use of the name *Felis onssa* by Bertoni (1914a) follows von Ihering (1910) and is a re-transcription of *onca* based on an earlier argument without foundation that the Portuguese letter ç cannot be conserved in Latinized names, nor replaced with the letter c (von Ihering, 1905).

“80 *Felis pardalis* L”.

“Chivi–guasú, Yaguareté–i, Yaguá–tirí (Brazil). Very variable; the principal colour forms I have found are the typical form and *griseus*”.

ID = OCELOT *Leopardus pardalis* (Linnaeus, 1758)

Felis Linnaeus, 1758: 41

[*Felis*] *Pardalis* Linnaeus, 1758: 42

Leopardus J.E. Gray, 1842: 260

Leopardus griseus J.E. Gray, 1842: 260

Felis pardalis (1904a; 1914a; 1915)

Comments: This is the *Chibigüazú* of Azara (1802, 1: 132) and *le Chibigouazou* of Azara (1801, 1: 152). The most frequently used common names in modern Paraguay are *Ocelote* (Spanish) or *Chivi–guasú* (Guaraní), with *Chivi* being a general name for smaller spotted cats and *guasú* meaning “big”. *Yaguareté–i* translates roughly as “little jaguar”.

The form “*griseus*” refers to *Leopardus griseus* Gray, 1842, which was designated the type species of *Leopardus* Gray, 1842 by Pocock (1917) when he resurrected the genus. The monophyly of *Leopardus* has been demonstrated repeatedly (Weigel, 1961; Salles, 1992; Johnson & O’Brien, 1997; Bininda–Edmonds *et al.*, 1999; Mattern & McLennan, 2000).

“81 *Felis tigrina* Erxl”.

“Chivi, Mbaracayá – Puerto Bertoni – Paraguay!”

ID = SOUTHERN ONCILLA *Leopardus guttulus* (Hensel, 1872a)

Felis Linnaeus, 1758: 41

Felis tigrina Schreber, 1775: 13, pl. CVI

Leopardus J.E. Gray, 1842: 260

Felis guttula Hensel, 1872a: 73

Felis tigrina (1914a; 1915)

F[elis]. tigrina (1925c)

Comments: A lack of gene flow between northern oncilla *Leopardus tigrinus* (Schreber, 1775) and southern oncilla *L. guttulus* (Hensel, 1872a) led Trigo *et al.*, (2013) and Oliveira do Nascimento & Feijó (2017) to treat them as separate species. The common names used by Bertoni, *Chivi* and *Mbaracayá*, both translate essentially to cat in different dialects of Guaraní (Azara, 1802).

Bertoni attributed authorship of *Felis tigrina* to Erxleben (1777: 517), following von Ihering (1910); however, the name dates from Schreber (1775).

“82 *Felis wiedi* Schinz”.

“Chivi, Mbaracayá – Puerto Bertoni! Iguazú– Argentina. The number of caudal vertebrae is considerably greater than in other species. Exhibits melanism like the two previous species”.

ID = MARGAY *Leopardus wiedii* (Schinz, 1821)

Felis Linnaeus, 1758: 41

Felis Wiedii Schinz, 1821: 235

Leopardus J.E. Gray, 1842: 260

Felis wiedi: Trouessart, 1904: 271

Felis wiedi (1914a)

F[elis]. Wiedi (1925c)

Comments: *Mbaracayá* is the Guaraní word for cat. Bertoni misspelled the species name following von Ihering (1910), who possibly followed Trouessart (1904), the earliest use of this misspelling I can find.

“83 *Felis geoffroyi* Orb”.

“Chaco, – common”.

ID = GEOFFROY’S CAT *Leopardus geoffroyi* (d’Orbigny & Gervais 1844)

Felis Linnaeus, 1758: 41

Leopardus J.E. Gray, 1842: 260

Felis Geoffroyi d’Orbigny & Gervais, 1844: 40

Felis Geoffroyi A. de W. Bertoni (1904a)

Felis geoffroyi A. de W. Bertoni (1930)

Comments: This is the *Mbaracayá* of Azara (1802, 1: 147), though Azara did not find the species in Paraguay. Bertoni (1930) reported the species for Paraguay for the first time (despite mentioning it previously in Bertoni, 1904a) stating that he examined numerous skins from the Chaco and that it appears to be common. However, in his 1930 paper he also incorrectly considers this species a synonym of *Felis guttula* Hensel, 1872a. *Leopardus geoffroyi* remains the most common small spotted cat in the Chaco today.

“Family Canidae”

Comments on the Canidae (84–86): Bertoni (1939) departed from his dependence on von Ihering (1910) for Carnivora nomenclature with the Canidae, though von Ihering was clearly the source in Bertoni (1914a). By the time of the second edition of the *Catálogos*, the nomenclature of the South American Canidae was in a state of constant revision (Mivart, 1890; Winge, 1895; Studer, 1905; J.A. Allen, 1905; von Ihering, 1910; Osgood, 1915b, 1934; Thomas, 1914; Kraglievich, 1930; Stiles & Baker, 1930; Cabrera, 1931). Cabrera (1931) appears to be the source that Bertoni most closely followed.

The common name *Aguara* is commonly used in Paraguay for canids (and also for raccoons). Cartes (2014) argues that the word *Aguara* is composed of two parts *Agua* meaning rounded or bulky and *Ra/Rague* meaning fur or pelage, interpreting the word as translating to fierce animals with long fur or bulky tail. However, it may also be onomatopoeic derived from the call of certain foxes, or from *Yagua* and *Ra/Rague* meaning predators with long fur or pelage.

“84 *Cerdoción thous entrerianus* Burm. forma *melampus* Wagn”.

“*melampus* Wagner (1841) form – Aguará–cháî. Puerto Bertoni; Mondaíh”.

ID = CRAB–EATING FOX *Cerdocyon thous* (Linnaeus, 1766) (Figure 9)

Canis Linnaeus, 1758: 38

[*Canis*] *Thous* Linnaeus, 1766: 60

Canis Azarae Wied, 1824: text with pl. 23

Cerdocyon C.H. Smith, 1839: 259

Canis melampus Wagner, 1841: pl. 92E

Canis Entrerianus Burmeister, 1861: 400

Cerdoción A. de W. Bertoni, 1939: 12

Canis thous (1914a)



Figure 9. Crab-eating Fox *Cerdocyon thous*, Estación Tres Gigantes, Alto Paraguay department. (Photo: Paul Smith).

Comments: This is, in part, the *Agüarachay* of Azara (1802, 1: 271; see Smith & Ríos, in press) and *l'Agouarachay* of Azara (1801, 1: 317). Bertoni (1914a) listed only *Canis brasiliensis* Schinz, 1821, for Paraguay (a name based partly on Azara), with *Canis thous* treated as hypothetical, but he later confessed his ongoing confusion as to the nomenclature (Bertoni, 1925b).

The reference to the “forma *melampus*” perhaps is based on the vague description in von Ihering (1910: 219), who referred to it as dark ashy grey with black legs, and the most common form in western Brazil. The only widespread and abundant fox in eastern Paraguay is the crab-eating fox, so clearly this was the species intended by *Canis brasiliensis* in Bertoni (1914a). *Canis brasiliensis* probably was the name Bertoni used for specimens showing reddish colouration, with “forma *melampus*” referring to greyer individuals of the same species. Cabrera (1931: 59) noted that “color differences are of little, if any, taxonomic value in the crab-eating dogs” and synonymized *Canis melampus* Wagner, 1841, with the subspecies *C. t. azarae* (Wied, 1824), not *C. t. entrerianus* (Burmeister, 1861), which is the southernmost subspecies (Berta, 1981). Wied (1824: pl.20), who believed he was describing the same animal as the *Agüarachay* of Azara, stated that his *Canis azarae* “habite generalmente les forets et les buissons du Bresil et de Paraguai” (“generally inhabits the forests and bushes of Brazil and Paraguay”). Bertoni followed Cabrera (1931) in including *C. t. entrerianus* as part of the Paraguayan fauna.

“85 *Chrysocyon brachyurus* (Ill.)”.

“Aguará–guasú; – Mondaíh”.

ID = MANED WOLF *Chrysocyon brachyurus* (Illiger, 1815)

Canis Linnaeus, 1758: 38

[*Canis*] *brachyurus* Illiger, 1815: 109

canis jubatus A.G. Desmarest, 1821: 198

Chrysocyon C.H. Smith, 1839: 241

Canis jubatus (1914a)

Comments: This is the *Agüaragüazú* of Azara (1802, 1: 266) and *l’Agoura–Gouazou* of Azara (1801, 1: 307). This local name roughly means big fox. Bertoni (1914a) used *Canis jubatus* Desmarest, 1821, for the maned wolf, the same name used by von Ihering (1910) and which is based on Azara’s (1801) description. However, Osgood (1919) pointed out the existence of two earlier names, also based on Azara’s description: *Vulpes cancrosa* Oken, 1816: 1036 (an unavailable name), and *Canis brachyurus* Illiger, 1815, which has priority.

“86 *Pseudalopex g. gymnocercus* Osgood”.

“Asunción”.

ID = CRAB–EATING FOX *Cerdocyon thous* (Linnaeus, 1766)

Canis Linnaeus, 1758: 38

[*Canis*] *Thous* Linnaeus, 1766: 60

[*Procyon*] *gymnocercus* G. Fischer, 1814: 178

Can[is]. Brasiliensis Schinz, 1821: 220

Cerdocyon C.H. Smith, 1839: 259

Lycalopex Burmeister, 1854: 95

Pseudalopex Burmeister, 1856: 24

Canis brasiliensis (1914a; 1925b)

Comments: Bertoni’s *Pseudalopex gymnocercus* is not the *l’Agouarachay* of Azara (1801, 1: 317), as commonly understood. Smith & Ríos (in press) show that the description is composite and contains only minor reference to *P. gymnocercus*. There is good reason to believe that the individual described as the the *Agüarachay* is not this species at all, based on the black muzzle, white ventral pelage, and the all-dark juveniles (all of which are consistent with *Cerdocyon thous*), though other parts of the description resemble *Lycalopex gymnocercus*, and mention of its presence in the Buenos Aires region definitely refers to the latter species (Smith & Ríos, in press).

The reference to “Osgood” by Bertoni (1939) is easily mistaken as the author of the taxon “*Pseudalopex g. gymnocercus*”, but the author was G. Fischer (1814) who based his description on the *l’Agouarachay* of Azara. Osgood (1915) merely pointed this out as the earliest available name, believing the *l’Agouarachay* referred to the southern “zorro de campo” group currently in the genus *Lycalopex* Burmeister, 1854. Thomas (1914) had earlier fixed the type species for fox genera of the Southern Cone, including the selection of *Canis brasiliensis* Schinz, 1821, (another name based entirely on Azara) as the type of *Cerdocyon*.

The name combination *Pseudalopex gymnocercus gymnocercus* was first used by Cabrera (1931), further evidence that this was Bertoni’s principal source. Bertoni seems to

have been unaware that Osgood (1934) had concluded that the correct name for the taxa is *Dusicyon (Dusicyon) gymnocercus* (G. Fischer, 1814), indicating that his reference is to Osgood (1915), not Osgood (1934). Nonetheless, Bertoni's attribution of the name to Osgood betrays the link to Azara, and the locality given indicates that this is the same animal referred to in Bertoni (1914a, 1925b) as *Canis brasiliensis* Schinz, 1821.

Bertoni (1925b) reported an albino specimen and described his *Canis brasiliensis* as "variable" and "still common around the city" (of Asunción), adding that it arrived in Puerto Bertoni in 1917. There are no concrete records of pampas fox *L. gymnocercus* in the mainland Oriental region of Paraguay, where the crab-eating fox *Cerdocyon thous* remains abundant. There is little doubt that Bertoni was referring to reddish variants of the latter species (Smith & Ríos, in press) and not to *Canis brasiliensis* (*sensu* von Ihering, 1910), which is indeed *L. gymnocercus*.

"Family Procyonidae"

Comments on the Procyonidae (87–88): The principal source for Bertoni's nomenclature of procyonids was von Ihering (1910).

"87 *Nasua narica* (L.). "Kuatí (1), Kuatí-mondé."

"([Footnote] 1) Dr. von Ihering (1910) considers *Nasua solitaria* Schinz, 1821, also known as Kuati mondé or Kuatí hañó, to be a synonym of this species; they are nothing more than old specimens that leave the troops. Effectively, I have also failed to find adults amongst the social ones".

ID = BROWN-NOSED COATI *Nasua nasua* (Linnaeus, 1776)

[*Viverra*] *Nasua* Linnaeus, 1766: 64

[*Viverra*] *Narica* Linnaeus, 1766: 64

Nasua Storr, 1780: 34

Nasua solitaria Schinz, 1821: 199

Nasua nasua (1914a)

Comments: This is the *Cuatí* of Azara (1802, 1: 293) and *Le Couati* of Azara (1801, 1: 334). Kuatí has been interpreted to mean "belt nose" in reference to the habit of sleeping with the nose tucked under the waist (Gompper & Decker, 1998). However, Cartes (2014) stated that the correct source of the name was a contraction of *Aku'a* pointed and *ti* nose "pointed nose". Alternatively, it may be derived from *kua* meaning hole and *ti* nose, "hole nose" in reference to the foraging behaviour which involves inserting the nose into holes.

Linnaeus's (1776) *Viverra narica* was described as "*V. subfusca, cauda concolore*" (subfuscous, tail concolour) on the same page as *Viverra nasua*, which was described as "*V. rufa, cauda albo annulata*" (rufous, white ringed tail). *Nasua narica* is the name now applied to the white-nosed coati of Central America.

Bertoni's footnote said that he had failed to find adults among the social animals. In most populations, only adult males are solitary with adult females remaining with the troop (Gompper & Decker, 1998), though in some populations males also are members of social groups (Hirsch, 2011). However, social groups always contain adults.

“88 *Procyon cancrivorus brasiliensis* Iher”.

“Aguará–popé. – Puerto Bertoni, Asunción”.

ID = CRAB–EATING RACCOON *Procyon cancrivorus* (G. Cuvier, 1798)

Procyon Storr, 1780: 35

Ursus cancrivorus G. Cuvier, 1798: 113

Procyon cancrivorus brasiliensis H. von Ihering, 1910: 228

Procyon cancrivorus brasiliensis (1914a)

Comments: This is the *Popé* of Azara (1802, 1: 278) and *l’Agouarapopé* of Azara (1801, 1: 324). *Aguará–popé* means fox with flat hands. The subspecies *P. c. brasiliensis* von Ihering, 1910, is a junior synonym of *P. c. nigripes* (Mivart, 1886: 347).

“Family Mustelidae”

Comments on the Mustelidae (89–95): Again, von Ihering (1910) was Bertoni’s principal taxonomic source for the Mustelidae, with several peculiarities of nomenclature common to von Ihering’s work and the *Catálogos*. Current family-level taxonomy includes modern families for the genera treated as mustelids by Bertoni (1939) as follows: *Conepatus* (Mephitidae); *Eira*, *Galictis*, *Lontra*, *Pteronura* (Mustelidae); *Speothos* (Canidae).

“89 *Conepatus chilensis* (Ill.)”.

“Chaco – Yagua–né. (2) I have heard reports of *Conepatus* from the east and south, though they require confirmation.”

“([Footnote] 2) The live examined specimen showed the colors of the form *maipurito*”.

ID = MOLINA’S HOG–NOSED SKUNK *Conepatus chinga* (Molina, 1782)

Viverra chinga Molina, 1782: 342

[*Viverra*] *Mapurito* J.F. Gmelin, 1788: 88

Gulo ?suffocans Illiger, 1811: 109

Mephitis chilensis A.G. Desmarest, 1818: 515

Conepatus J.E. Gray, 1837: 581

Conepatus suffocans forma *marputio*: Bertoni, 1925a: 68

[*Conepatus chilensis*] forma *maipurito*: Bertoni, 1939: 12

Conepatus suffocans forma *marputio* (1925a)

Comments: This is the *Yagüaré* of Azara (1802, 1: 187) and *l’Yagouaré* of Azara (1801, 1: 211), who did not report the species from Paraguay. *Yagua–né* (as it is written in modern Guaraní) means roughly “stinking dog or predator”. *Conepatus chinga* (Molina, 1782) is the name applicable to the only member of the genus in southern South America and a thorough discussion of the convoluted taxonomic history of the southern South American skunks is provided by Schiaffini *et al.*, (2013).

Bertoni (1925a) reported the open country *Conepatus suffocans* (Illiger, 1811) (based on Azara’s *l’Yagouaré*) for Paraguay, adding that possibly the forest species *Conepatus chilensis* (Desmarest, 1818) also occurs somewhere in the country. Bertoni commented that both species are very variable and cause much confusion. This follows major authors of the time, including Hensel (1872a) and von Ihering (1910), in treating the two as distinct taxa (though neither Hensel nor von Ihering made the ecological distinction referred to by Bertoni). In contrast, only *C. chilensis* is listed in Bertoni (1939), but in both reports the

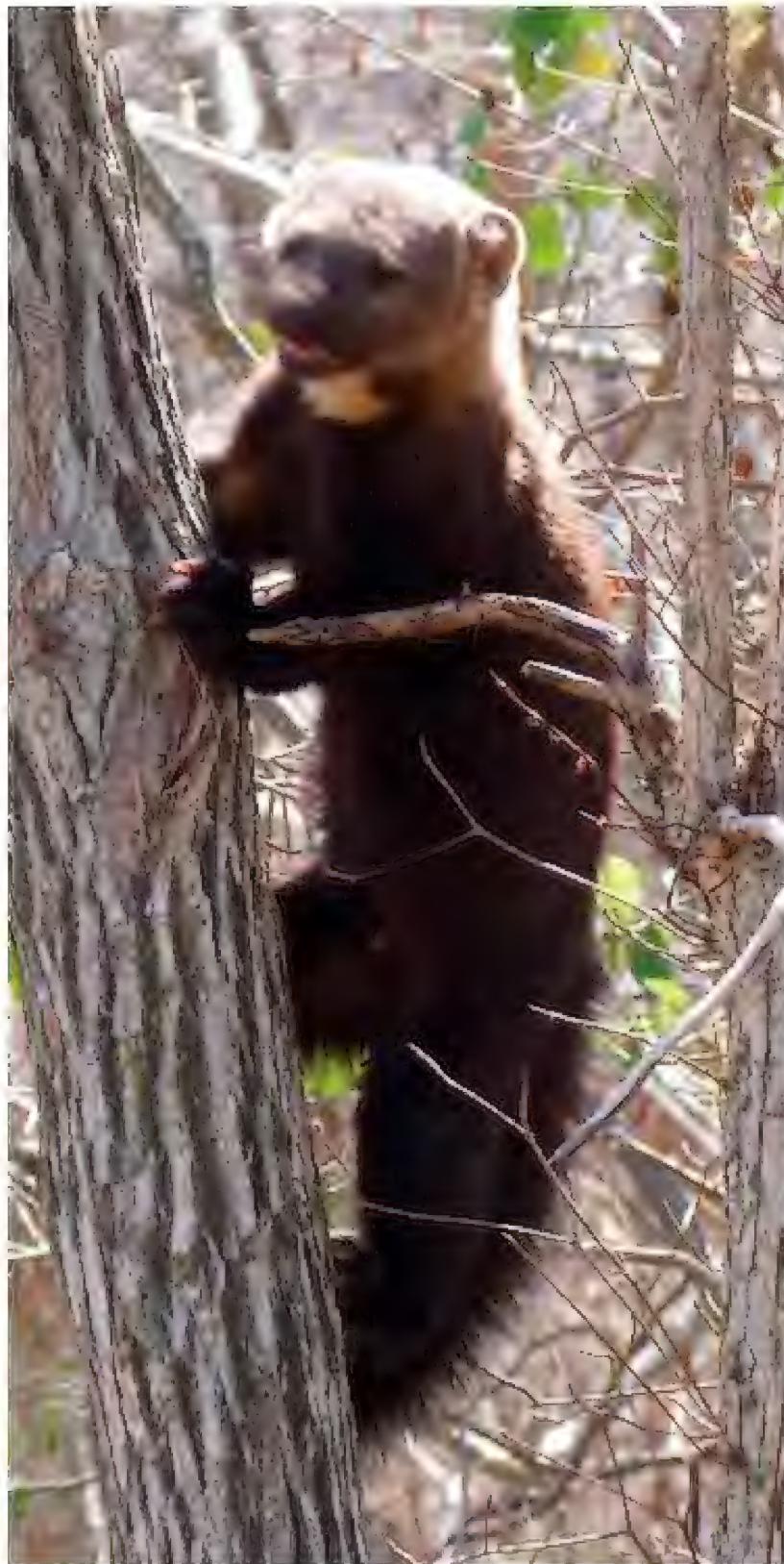


Figure 10. Tayra *Eira barbara*, Cerro León, Alto Paraguay department. (Photo: Paul Smith).

“60⁵ *Tayra barbara* (L.)”.

“Eirá. (Tayrá Oken, 1816) – Alto Paraná”.

ID = TAYRA *Eira barbara* (Linnaeus, 1758) (Figure 10)

[*Mustela*] *barbara* Linnaeus, 1758: 46

Galera Browne, 1789: 485

Tayra Oken, 1816: 1001

Eira C.H. Smith, 1842: 201

Galera barbara (1914a; 1932)

specimens were attributed to the “form *mapurito*” (spelled incorrectly and differently in each publication), and the name can be assumed to have been applied to the same specimens.

Viverra mapurito Gmelin, 1788 is based on the Moufette Mapurito de Mutis (Act. Holmiens, 1768) of “Nueva Hispania”. Hensel (1872a), without sound basis, said that the Mapurito is the Petit Füret of Azara (1801), but Azara’s description refers to the lesser grison *Galictis cuja*, and was not used in the sense in that Bertoni or Gmelin employed the name. This form was mentioned by Humboldt (1811) for northern South America and Trouessart (1897) extended the distribution to Brazil. A more complete description was provided by Coues (1877: 249), who included an ambitiously ample synonymy (including most of the names in use at the time) and referred to it as the “The White-backed Skunk”. It seems that Bertoni’s (1939) “forma *maipurito*”, is simply *Conepatus chinga* with a white dorsum (commonest colour pattern in Paraguay). Bertoni may not have been using “*maipurito*” in any definite sense that can be attributable to any previous author, and this could explain his peculiar spellings.

Bertoni mentioned rumours of *Conepatus* in southern and eastern Paraguay, but to date the species is considered to be confined to the Chaco and northern Oriental region in Paraguay, although it is present in Misiones province, Argentina (Chebez, 1996).

⁵ A typographical error on p. 12 of the *Catálogos* [= 90].

Comments: This is the *Huron mayor* of Azara (1802, 1: 172) and *le Grand Furet* of Azara (1801, 1: 197). Bertoni (1939) uses the unavailable generic name *Tayra* Oken, 1816, following von Ihering (1910). The generic name *Galera* Browne, 1789, as used by Bertoni (1914a, 1932), is based on a species of mongoose (J.A. Allen, 1908). The earliest available generic name is *Eira* C.H. Smith, 1842 (Herskovitz, 1949). According to Cartes (2014) the Guaraní name *Eirá* translates as honey eater.

“91 *Grison allamandi* (Bell.)”.

“Yaguapé – Puerto Bertoni; Itá”.

ID = GREATER GRISON *Galictis vittata* (Schreber, 1776)

Viverra vittata Schreber, 1776: pl. 124, text 1777: 447

Galictis Bell, 1826: 552

Galictis allamandi Bell, 1837: 204

Galictis (*Grisonia*) *crassidens* Nehring, 1885: 167

Grison J.A. Allen, 1902: 377

G[rison]. crassidens (1932)

Grison allamandi (1914a; 1932; 1939)

Comments: Confusion over the type of *Viverra vittata* (Schreber, 1776) and *Galictis allamandi* (Bell, 1837), both based on paintings by different artists of the same specimen, led some of Bertoni’s contemporaries, including von Ihering (1910), to use *G. allamandi* for the larger species and *G. vittata* for the smaller. This application was followed by Bertoni’s 1914 *Catálogos* (Husson, 1978; Smith *et al.*, 2013).

Bertoni (1932; 1939) used *G. allamandi* for the greater grison, but applied the name, *Grisonella huronax* Thomas, 1921, to the lesser grison according to Smith *et al.*, (2013), who noted that this grison was the same as Bertoni’s (1932) *G. vittata*. Bertoni (1932), attempting to clarify his nomenclature, noted that a large live *G. allamandi* specimen he observed at Itá was identical to *G. crassidens* Nehring, 1885. Nehring’s name is a synonym of *Galictis vittata* and, jointly with the locality provided, confirms Bertoni’s usage of *G. allamandi* for the greater grison (Smith *et al.*, 2013).

Despite the wide distribution suggested by Bertoni, the lack of additional material led to the consensus that *G. vittata* did not occur in Paraguay (Yensen & Tarifa, 2003). Smith *et al.*, (2013) reported new records, clarified the terminology used by Bertoni, and confirmed that, despite superficial confusion resulting from a modern understanding of his taxonomy, his use of synonyms for the larger (now known as *G. vittata*) and smaller species (now known as *G. cuja*) was actually consistent and confirmed the existence of both species in Paraguay.

Yaguapé means “dwarf dog” or “flattened dog or predator” (Bertoni, 1932).

“92 *Grisonella huronax* Thos”.

“Yaguá kambé, Yaguapé – Puerto Bertoni”.

ID = LESSER GRISON *Galictis cuja* (Molina, 1782)

Viverra vittata Schreber, 1776: pl. 124, text 1777: 447

Mustela Cuja Molina, 1782: 291

Galictis Bell, 1826: 552

Grison J.A. Allen, 1902: 377

Grissonella Thomas, 1912: 46

Grissonella huronax Thomas, 1921: 213

G[rison]. vittatus (1914a; 1932)

Grissonella huronax (1932; 1939)

Comments: This is the *Huron menor* of Azara (1802, 1: 182) and *le Petit Furet* of Azara (1801, 1: 190). *Grissonella huronax* Thomas, 1921, was based on specimens from central and eastern Argentina (type locality: Mar del Plata, S.E. Buenos Ayres). Earlier Thomas (1907: 162) had described *Grison furax* from Brazilian specimens (type locality: San Francisco dos Campos, S. Minas Geraes. Altitude 1580 m). Both forms are now considered subspecies of *G. cuja*. The lesser grisons of eastern Paraguay, from where Bertoni's material came, is properly referable to *G. c. furax*; not *G. c. huronax* (Yensen & Tarifa, 2003).

Thomas's (1907: 162) description of *furax* contains the confusing statement that his *Grison furax* "is the common grison or "Furão" of southern Brazil, generally known by the name of '*Galictis vittata*'", but given the nomenclature of the time Thomas was likely referring to *G. cuja* and not what we currently understand as *G. vittata* (see Husson, 1978).

Yaguá kambé and Yaguapé both mean "dwarf dog" or "flattened dog" (Bertoni, 1932).

"93 *Speothos (Icticyon) venaticus* Lund".

"Rio Apá (Mr. Fortunato Amarilla): Chaco (Zoological Gardens)".

ID = BUSH DOG *Speothos venaticus* Lund, 1839

Canis Linnaeus, 1758:38

Speothos Lund, 1839: 224

C[ynogale]. venatica Lund, 1842: 203

Icticyon Lund, 1843: 80

Canis v[enaticus]. (1924a)

Speothos venaticus (1924a)

Comments: Bertoni (1924a) reported this species for Paraguay on the basis of a second-hand sight record from the Apa River reported to him by Don Fortunato Amarilla and a specimen acquired by the Asunción Botanical Gardens from the "Chaco Paraguayo" that was reported in a Paraguayan newspaper by Prof. C. Fiebrig. Bertoni claimed never to have heard news of the species in Alto Paraná in 30 years, and the fact that he cited the same two records in the *Catálogo* 12 years later suggests that he still had not confirmed additional specimens in Paraguay up to that point.

Though Bertoni (1924a) correctly referred to this species as a canid, its transference to Mustelidae in Bertoni (1939) is odd. Von Ihering (1910) mentioned certain mustelid-like characters, but retained the species in Canidae.

"94 *Lutra paranensis* Rengger".

"Rio Paraguay, Paraná, Mondaíh".

ID = NEOTROPICAL RIVER OTTER *Lontra longicaudis* (Olfers, 1818)

Lutra Brisson, 1762: 13

L[utra]. longicaudis Olfers, 1818: 233

Lutra paranensis Rengger, 1830: 128

Lontra J.E. Gray, 1843a: 118

Lutra paranensis (1914a)

Comments: This is the *Nutria* of Azara (1802, 1: 304) and *la Loutre* of Azara (1801, 1: 348). New World otter species are now included in *Lontra* Gray, 1843 following Van Zyll de Jong (1972) and Kellnhauser (1983).

Lutra paranensis Rengger, 1830, was commonly used for this species by regional authors in the early 20th Century because of its priority over *Lutra platensis* Waterhouse, 1838: 60, which had been employed by earlier authors (Hensel, 1872a; Burmeister, 1879; Cope, 1889; Thomas, 1889; Forsyth Major, 1897; Trouessart, 1897). Hershkovitz (1959a) brought to light the validity of names published by Olfers (1818), including *Lutra longicaudis*, which has priority over both names.

As pointed out by Smith (2020), *Lutra paranensis* Rengger, 1830, has been treated as a synonym of *Pteronura brasiliensis* (Gmelin, 1788) since Nehring (1900). However, Bertoni's usage (1914a, 1939) followed von Ihering (1910), who correctly applied the name *Lutra paranensis* Rengger, 1830 to a description of the species now known as *Lontra longicaudis* (Olfers, 1818; see Smith (2020)).

"95 *Pteronura brasiliensis* (Zimm.)".

"Arirâi (Mondaih); Rio Paraná; Guairacá – Chaco and western Brazil".

ID = GIANT OTTER *Pteronura brasiliensis* (Zimmerman, 1780)

Lutra (brasiliensis) Zimmerman, 1780: 316

Pteronura J.E. Gray, 1837: 580

Pteronura brasiliensis (1914a)

"Order VI CHIROPTERANS"

Comments on the Chiroptera (96–125): The treatment of the Chiroptera (with the exception of Phyllostomidae) is, after the "Muridae", the weakest section of Bertoni's (1939) Mammal *Catálogo*. He employed a confusing, error-strewn taxonomy that is vague on details and dated when published.

Perhaps sensing the need for clarification, Podtiaguin (1944) corrected many of the errors in the *Catálogos*, and applied an at least superficially more rigorous approach to record acceptance than Bertoni's (1939), even if Podtiaguin's presentation of the data was somewhat chaotic. He relegated some of Bertoni's species to of possible occurrence, referring to them as species that are "unknown to me, doubtful, or not yet studied". Bertoni (through the publications by Thomas, and identifications of specimens collected by Foster) has since been vindicated on many of the species that Podtiaguin rejected, but we must assume that at that time, Podtiaguin (1944) had good reason for his determinations, including his awareness of Bertoni's tendency to accept "learned hearsay" as evidence of occurrence. Unfortunately, Podtiaguin (1944) was equally lax in providing taxonomic justifications for his identifications and committed some of the same errors in listing species without supporting references, specimen localities, or distribution data. Considerably more detail is provided by Podtiaguin for the Phyllostomidae, but it is this family which, among the Chiroptera, is the least likely to contain errors. Nevertheless, any specimens upon which either publication was based and that remained in Paraguay, have since been lost and therefore, are unavailable for examination.

Bertoni's (1939) list closely mirrors Thomas's (1901c) publication on a collection of bats from Paraguay. Thomas (1901c: 435) based his report on bats collected by Guillermo Foster in "Central Paraguay" (mainly Sapucay and Villarrica, Guairá department) and

contains a nearly identical nomenclature to that of the *Catálogos*. Bertoni (1939), however, made no reference to the localities that Thomas (1901c) listed, and in some cases, provides no distributional data at all, even though they are available in that publication. Foster (1905) published on the same specimens as did Thomas, and his work is a virtual carbon copy of Thomas (1901b), with a few additional details, but lacking most of the locality data. It is difficult to escape the conclusion that Thomas (1901c) was the primary source for Foster (1905) and that Foster, in turn, was the primary source for Bertoni (1939), as all three share quirks of format and nomenclature. Indeed, in the introduction to the Mammal section of the *Catálogos* there is vague reference to Foster (1905), where Bertoni wrote that the specimens cited by Foster and left at the Colegio Nacional have already “unhappily been lost”. It is unclear whether these represented additional specimens to those referred to in Thomas (1901c), presumably in the Natural History Museum, London, or even that Bertoni was even aware of Thomas (1901c).

Foster died in March 1915, just one year after publication of Bertoni’s first edition of his *Catálogos*, and over two decades prior to the publication of the second edition.

The most recent complete review of the distribution of bats in Paraguay is by López-González (2005).

“Family Vespertilionidae”

“96 *Dasypterus ega* Gerv”.

“Puerto Bertoni”.

ID = SOUTHERN YELLOW BAT *Dasypterus ega* (Gervais, 1856)

Nycticejus Ega P. Gervais, 1856: 73

Dasypterus W.C.H. Peters, 1870: 912

Dasypterus ega (1914a)

Comments: *Dasypterus ega* is a name combination first used by H. Allen (1894) and subsequently widely accepted, being distinguished from “*Atalapha* Rafinesque, 1814” by a single as opposed to two upper premolars. The species was then placed in *Lasiurus* Gray, 1831, until the molecular distinctiveness of *Dasypterus* was recognized and its usage as a full genus revived by Baird *et al.*, (2015; see 98 *Atalapha cinerea*).

Puerto Bertoni is in Alto Paraná department, but López-González (2005) did not include that department in its distribution. Podtiaguin (1944) treated *D. ega* as hypothetical, but did list *D. egregius* (Peters, 1870: 912). The former is now known to be widespread in Paraguay (though never subsequently found in the Alto Paraná forests from where Bertoni cites it), while the latter, an enigmatic and rare species known from very few specimens in the humid forests of eastern Brazil, has never been reported from Paraguay.

“97 *Atalapha borealis* (Müller.)”.

“Asunción”.

ID = SOUTHERN RED BAT *Lasiurus blossevillii* [Lesson, 1826]

Vespertilio borealis P.L.S. Müller, 1776: 20

Atalapha Rafinesque, 1814: 12

Vespertilio blossevilli [Lesson], 1826: 95

Lasiurus Gray, 1831: 38

Lasiurus borealis (1914a)

Comments: *Vespertilio blossevillei* was the name employed in an anonymous abstract anticipating the description of *Vespertilio bonariensis* Lesson & Garnot, 1827: 137, and has date priority over the name intended by the descriptors (J.A. Allen, 1900c). Both names were attributed to Lesson & Garnot, 1827 in subsequent literature. However, Lesson (1842) listed himself as the sole author of both *Vespertilio bonariensis* and *Vespertilio blossevillei* [sic] and thus he was treated as such by Gardner & Handley (2008).

Both Thomas (1901c) and Foster (1905) use the name *Lasiurus borealis bonariensis* (Lesson & Garnot, 1827) for this species. However, with the recognition of the southern red bat as a species (Morales & Bickham, 1995), the omission of the subspecific epithet by Bertoni (1939) should not be understood in a modern context to refer to the northern red bat *Lasiurus borealis* (Müller, 1776: 20).

Atalapha Rafinesque, 1814, was the generic name used for lasiurines during most of the 19th Century because it was presumed to have priority over *Lasiurus* Gray, 1831. Miller (1897) showed that *Atalapha* was based on a Sicilian bat and could not be applied to a bat genus restricted to the New World, with *Atalapha sicula* as the type species. Bertoni (1939) applied a more antiquated generic taxonomy than he had done previously in Bertoni (1914a).

Podtiaguin (1944) following usage by Miller (1897), used the name *Lasiurus borealis mexicanus*, which Miller (1897: 31) attributed to Saussure and described it “as the first name based on the southern race”. However, *Atalapha mexicana* Saussure, 1861: 97, is a synonym of *Aeroestes cinereus* (Palisot de Beauvois, 1796).

“98 *Atalapha cinerea* (Pal. de Beauv.)”.

“Asunción”.

ID = SOUTH AMERICAN HOARY BAT *Aeroestes villosissimus* (É. Geoffroy St.-Hilaire, 1806)

Vespertilio linereus Palisot de Beauvois, 1796: 18

[misspelling hand-corrected prior to distribution]

Vesp[ertilio]. villosissimus É. Geoffroy St.-Hilaire, 1806: 204

Atalapha Rafinesque, 1814: 12

Lasiurus J.E. Gray, 1831: 38

Aeroestes Fitzinger, 1870: 427

Lasiurus cinereus (1914a)

Comments: *Vespertilio villosissimus* É. Geoffroy St.-Hilaire, 1806, is based on the *Chauve-Souris Septieme ou Chauve-Souris Brun-Blanchatre* of Azara (1801, 2: 284), and it is also the *Murcielago Blanquizco* of Azara (1802, 2: 303), and the type species of *Aeroestes* Fitzinger, 1870. Long considered a subspecies of *Lasiurus cinereus* (Palisot de Beauvois, 1796), the molecular differentiation of South American populations was demonstrated by Baird *et al.*, (2015) who used *Aeroestes villosissimus* for this species.

Azara wrote that he had several identical specimens, but did not provide locality data for them. Azara (in Agacino, 1941), however, stated that the described specimen was captured in the house of Dr Ignacio Pazos (see number 111 *Nyctinomus laticaudatus*) during February and given to Azara. Cabrera's (1958) restriction of the type locality to Asunción is reasonable based on the known distribution of the species (López-González, 2005).

The description is moderately brief, but not consistent with *Lasiurus cinereus* (*sensu lato*) in several key aspects. The pelage is described merely as “*pardo muy blanquizco*” (very pale brownish-white), lacking any reference to the frosted appearance or the diagnostic yellowish “*balaclava*” of *A. cinereus*, which do not appear easily dismissible by reference

to mere oversight. The description of the uropatagium (which is furred except for the border) means that it is clearly a member of the “ex-*Lasiurus*” group, but overall, the description seems clearly to refer to the Southern Yellow Bat *Dasypterus ega*, a much more frequently encountered species in the Paraguay River Basin (Smith & Teta, 2022). Smith & Teta (2022) recommend that current nomenclatural usage be retained, and a petition to the ICZN for conservation of current usage and declaring a neotype is in preparation. See number 97 *Atalapha borealis*.

“99 *Myotis albescens* Geoff”.

“Alto Paraná”.

ID = SILVER-TIPPED MYOTIS *Myotis albescens* (É. Geoffroy St. Hilaire, 1806)

Vesp[ertilio]. albescens É. Geoffroy St.-Hilaire, 1806: 204

Myotis Kaup, 1829: 106

Myotis albescens (1914a)

Comments: *Vespertilio albescens* É. Geoffroy St.-Hilaire, 1806 is based on Azara (1801, 2: 294) *Chauve-Souris Douzieme ou Chauve-Souris Brun-Obscure*, which also is also the *Murcielago Pardo Obscuro* of Azara (1802, 2: 309).

Neither Azara (1801; 1802) nor É. Geoffroy St.-Hilaire (1806) provided any locality for this species, but Acosta y Lara (1950) drew attention to an unpublished manuscript by Azara that was reproduced by Agacino (1941) in which Azara stated that he collected “Morcielago 4º” (identifiable as this species from the exact correspondence in measurements provided) in a flock of bats that circled in his room at the Estancia San Solano next to Estero Yberá. This led Acosta y Lara (1950: 6) to state that if a locality with this name existed then type locality should be restricted to “la estancia de San Solano junto al Estero Iberá ... al sur del río Paraná en la provincia de Corrientes”. Cabrera (1958) subsequently confused matters by giving the type locality erroneously as “Estancia de San Solano, en el extremo sur del Paraguay, frente al Estero del Iberá”, and Laval (1973) designated a neotype (AMNH 205195) collected by Merlin D. Tuttle at Yaguarón, Paraguari department, on 2 June 1963.

The locality Estancia San Solano can be located, thanks to the extraordinary scholarship of Mones & Klappenbach (1997) and is indeed in Corrientes, Argentina. Azara (1904: 225–226) stated that he was at Estancia San Solano for two nights (22 and 23 December 1787) and that it is located at 28° 31' 42" S, 57° 7' W. Indeed, to this day there is an estancia with this name at approximately the same location (28° 22' 55" S, 56° 51' 12" W). Nonetheless the neotype designation by Laval (1973) stands.

“100 *Myotis isidori* Gerv”.

“Corrientes, Paraguay?”

ID = UNIDENTIFIED

Myotis Kaup, 1829: 106

Vespertilio isidori d'Orbigny & Gervais, 1847: 16

Myotis isidori (1914a)

Comments: Bertoni (1939) considered *Vespertilio isidori* (d'Orbigny & Gervais, 1847) to be of potential occurrence in Paraguay (hence the unitalicized name). The type locality is Corrientes (république Argentine), but it is usually treated as a synonym of *M. albescens* (É. Geoffroy St. Hilaire, 1806:204). The identification of the holotype is questionable

(Braun *et al.*, 2009) and there is no reason to further complicate the understanding of this mysterious name by associating it with Paraguay.

“**101** *Myotis nigricans* (Wied)”.

“Alto Paraná, Asunción”.

ID = BLACK MYOTIS *Myotis nigricans* (Schinz, 1821)

Vesp[ertilio]. nigricans Schinz, 1821:179

Myotis Kaup, 1829: 106

Myotis nigricans (1914a)

Comments: Described as *Vespertilio nigricans* by Schinz (1821) with type locality “Östküste von Brasilien”. This was identified as “Fazenda de Agá en der Gegend des Flusses Iritiba” by Wied–Neuwied (1826: 268).

“**102** *Myotis ruber* Geoff”.

“Asunción”.

ID = GOLDEN MYOTIS *Myotis midastacus* Moratelli & Wilson, 2014 or *Myotis* cf. *simus* sensu Moratelli & Wilson, 2014

Vesp[ertilio]. ruber É. Geoffroy St.–Hilaire, 1806: 204

Myotis Kaup, 1829: 106

Myotis midastacus Moratelli & Wilson, 2014: E19

Myotis ruber (1914a)

Comments: *Vespertilio ruber* É. Geoffroy St.–Hilaire, 1806, the valid name for the Red *Myotis* *Myotis ruber*, is based on the *Chauve–Souris Onzieme ou Chauve–Souris Cannelle* of Azara (1801, 2: 292), which also is the *Murcielago Acanelado* of Azara (1802, 2: 308). Azara (1801) did not provide a locality and Miller & Allen (1928) gave the type locality as “Paraguay, probably near Asunción” based on the premise that this is where Azara was stationed. *Myotis ruber* is a rare bat in Paraguay and known from few specimens. López–González (2005) did not include Asunción in the Paraguayan distribution, and Bertoni’s (1939) distribution of Asunción is likely because of the association with Azara.

LaVal (1973: 46) wrote the following: “In describing his *Chauve–souris onzieme ou Chauve–souris cannelle* Azara (1801) stated “*Le poi lest court, cannelle en–hout, et de la couleur du Roseau en–bas.*” This is the only portion of his (or Geoffroy’s) description that best applies to *Myotis ruber*. Because this name has been generally applied to bats of a single species fitting this description, I think it best to retain the name *ruber*”. LaVal (1973) thus recognized that *Myotis ruber* was a poor fit for Azara’s description but, unable to provide a concrete identification for it, and aiming to avoid unnecessary nomenclatural upheaval, he designated a neotype (USNM 115097) from nearby Sapucaí, collected by William Foster on 22 May 1901 to conserve usage of the name (a move criticized by Hershkovitz, 1976). Note that this locality is not in “Neembucú” [sic] as listed in the specimens examined section by LaVal (1973) and repeated by Wilson (2008), but in Paraguari department.

I agree that Azara’s description does not refer to *M. ruber* (Smith, 2023). Indeed, Azara (1802: 292) distinctly stated: “*La membrane del ala, y la que va al fin de la cola nacen de la conyuntura del tarso*” (The wing membrane and that which goes to the tip of the tail originates at the tarsal joint) and this character alone could eliminate *M. ruber* from consideration. The plagiopatagium of that species inserts at the level of the digits as in the vast majority of Neotropical *Myotis*. This is clearly an early reference to a bat in the *Myotis*

simus group, of which two species occur in Paraguay (Moratelli *et al.*, 2015), *Myotis* cf. *simus* and the recently described *Myotis midastacus* Moratelli & Wilson, 2014: E19, and these are distinguished from all other members of the genus by the plagiopatagium being attached to the foot by a narrow band of membrane (which may have been difficult to observe in Azara's specimens) See Fig 1b in López-González *et al.*, (2001).

"Family Emballonuridae"

Comments on the Emballonuridae (103–114): Bertoni's Emballonuridae included Molossidae (numbers 103–108, 110–111, and 114), Vespertilionidae (112–113), and Noctilionidae (109); but no species of Emballonuridae. The arrangement follows the family level arrangement by Trouessart (1897), except for Bertoni's inclusion of *Vespertilio dorianus* and *Histiotus velatus*. Bertoni's (1939) antiquated taxonomy for this group is strange because it ignores the key work on Chiropteran taxonomy by Miller (1907) who established the higher-level arrangement still largely in use today, and was 30 years old by the time the 1939 *Catálogos* was published. Just three years prior to the *Catálogos*, Sanborn (1937) published a review of the American Emballonurinae that followed the same basic arrangement as Miller (1907). Bertoni's failure to employ the accepted taxonomy of the time along with either no or sparse distributional data suggests that he lacked experience with this group.

"103 *Molosops bonariensis* (Peters)".

ID = SOUTHERN BONNETED BAT *Eumops bonariensis* (W.C.H. Peters, 1874)

Molossus É. Geoffroy St.-Hilaire, 1805: 279

Molossops W.C.H. Peters, 1866: 575

Promops bonariensis Peters, 1874: 232

Eumops Miller, 1906: 85

Molosops: A. de W. Bertoni, 1939: 13

Molossus bonariensis (1914a)

Comments: I can find no other reference that includes this species in the genus *Molossops*. Dobson (1876) first used the name combination *Molossus bonariensis*, and this was followed by Thomas (1901c) and Foster (1905). *Molossus* may have been Bertoni's intended name.

Bertoni (1939) provided no localities for the species, though Thomas (1901c: 440) listed a specimen from Asunción and wrote that it was collected by Kerr at Waikthlatingmangyalwa in the Northern Chaco (actually Presidente Hayes department in the eastern Paraguayan Chaco). Podtiaguin (1944) considered *Eumops bonariensis* of hypothetical occurrence in Paraguay.

"104 *Molossus cerastes* Thos".

"Chaco".

ID = CINNAMON DOG-FACED BAT *Cynomops abrasus* (Temminck, 1826)

Molossus É. Geoffroy St.-Hilaire, 1805: 279

Dysopes abrasus Temminck, 1826: 232

Molossus cerastes Thomas, 1901c: 440

Cynomops Thomas, 1920b: 189

Molossus cerastes (1914a)

Comments: Thomas (1901c: 440) described *Molossus cerastes* from two specimens collected by W. Foster at Villarrica and two from Sapucay. Foster (1905), however, listed only Villarrica as a locality. Thus, it is unclear why Bertoni (1939) would list the distribution as “Chaco”. Current understanding of the distribution of *C. abrasus* is that it is more widespread in the Oriental region of Paraguay than in the Chaco (López-González, 2005). It is also unclear why Podtiaguin (1944) considered this species undocumented in Paraguay when the name is based on Paraguayan specimens.

“105 *Molossus fosteri* Thos”.

“Chaco”.

ID = BROWN MASTIFF *Promops nasutus* (Spix, 1823)

Molossus É. Geoffroy St.-Hilaire, 1805: 279

Molossus nasutus Spix, 1823: 60

Promops P. Gervais, 1856: 58

Molossus Fosteri Thomas, 1901c: 438

Molossus fosteri (1914a)

Comments: An almost identical situation to the previous species. *Molossus fosteri* is based on two males and four females collected by Foster at Villarrica and Sapucay. Foster (1905) listed both localities, yet Podtiaguin (1944) considered the species undocumented, and Bertoni’s (1939) distribution “Chaco” does not correspond with the known specimens at that time. Though the species does occur in the Chaco (López-González, 2005), this is an area of the country apparently unfamiliar to Bertoni and, given the inexplicable similarities between the treatment of this and the previous species, it seems that “Chaco” may have been a guess in both cases.

Myers & Wetzel (1983) provided a detailed discussion as to why *Molossus fosteri* should be considered a junior synonym of *Promops nasutus* (Spix, 1823) and not as a subspecies.

“106 *Molossus obscurus crassicaudatus* Geoff”.

ID = PALLAS’S MASTIFF *Molossus molossus crassicaudatus* (É. Geoffroy St.-Hilaire, 1805)

V[espertilio]. *Molossus* Pallas, 1766: 49

Molossus É. Geoffroy St.-Hilaire, 1805: 279

Molossus crassi-caudatus É. Geoffroy St.-Hilaire, 1805: 279

Molossus obscurus É. Geoffroy St.-Hilaire, 1805: 279

Molossus obscurus crassicaudatus (1914a)

Comments: *Molossus molossus crassicaudatus* is based on Azara’s (1801, 2: 290) *Chauve-Souris Dixieme ou Chauve-Souris Chataine*, which also is the *Murcielago Pardo Acanelado* of Azara (1802, 2: 307). This remains the valid subspecies for Paraguayan populations today.

Azara (in Agacino, 1941) stated that his specimen was captured in the house of Dr. Joaquín Alos⁶ and given to him by Alos’s daughter. Cabrera’s (1958) restriction of the type locality to Asunción is thus accurate.

⁶ Joaquín de Alos y de Bru (Barcelona 1746 – Lima, Peru 18th C) became Governor of Paraguay on 4 May 1786, was received with honours in Asunción on 25 August 1787, and held that position until 7 April 1796.

Thomas (1901c: 437), based on specimens collected by Foster, listed *Molossus obscurus crassicaudatus* in Paraguay with localities Villa Rica and Paraguari. Thomas's text is faithfully reproduced in Spanish by Foster (1905). Bertoni (1939) adopted this nomenclature, but did not include the localities. Podtiaguin's (1944) inclusion of *Molossus obscurus* in his listing, yet treating *M. o. crassicaudatus* as hypothetical is nonsensical, given its Paraguayan type locality.

Husson (1962) summarized the complex taxonomic history of *Molossus molossus* (Pallas, 1766), and Dolan (1989) provided further comments with some different conclusions. Husson (1962) restricted the type locality of *M. obscurus* to Martinique.

"107 *Molossus rufus* Geoff".

"Asunción".

ID = RIVER MASTIFF *Molossus fluminensis* Lataste, 1891

Molossus É. Geoffroy St.-Hilaire, 1805: 279

Molossus rufus É. Geoffroy St.-Hilaire, 1805: 279

Molossus fluminensis Lataste, 1891: 658

Molossus rufus (1914a)

Comments: This is the *Chauve-Souris Sixieme ou Chauve-Souris Chataine* of Azara (1801, 2: 282) and the *Murcielago Castaño* of Azara (1802, 2: 302). Southern South American populations of *Molossus rufus* were split as *M. fluminensis* by Loureiro *et al.*, (2020).

"108 *Molossus temminki* (Lund.)".

ID = DWARF DOG-FACED BAT *Molossops temminckii* (Burmeister, 1854)

Molossus É. Geoffroy St.-Hilaire, 1805: 279

Dysopes Temminckii Lund, 1842: 128

Dysopes Temminckii Burmeister, 1854: 72

Molossops W.C.H. Peters, 1866: 575

Molossus temminki A. de W. Bertoni 1914a: 77

Molossus temminki (1914a)

Comments: *Molossops* Peters, 1866, was originally described as a subgenus of *Molossus*, and its use by Bertoni for this species follows both Thomas (1901c) and Foster (1905).

Authorship of the species-group name *temminckii* was attributed to Lund (1842) by Thomas (1901c) and Bertoni (1939), but Lund's name is a *nomen nudum*. Although Lund listed the species in several of his publications, he provided no description, thus the name is unavailable from this source. The first description that met requirements for availability was Burmeister, 1854 (A. Gardner, *in litt.*); authorship was correctly assigned by Podtiaguin (1944).

"109 *Noctilio leporinus* (L.)".

"Concepción".

ID = GREATER BULLDOG BAT *Noctilio leporinus* (Linnaeus, 1758)

[*Vespertilio*] *leporinus* Linnaeus, 1758: 32

Noctilio Linnaeus, 1766: 88

Noctilio leporinus (1914a)

Comments: This is the *Chauve-Souris Cinquieme ou Chauve-Souris Rougeatre* of Azara (1801, 2: 280) and the *Murcielago Roxizo* of Azara (1802, 2: 301). *Noctilio rufescens* Olfers, 1818: 225, is based on Azara's (1801) description and is the valid subspecific name for the Paraguayan population.

Noctilio leporinus was not listed for Paraguay by either Thomas (1901c) or Foster (1905). Podtiaguin (1944) inexplicably listed *Noctilio leporinus* as undocumented, but accepted the subspecies *N. l. rufipes* d'Orbigny (1837: pl. 9). Although d'Orbigny's name is now considered a junior synonym of *N. l. rufescens*, its use by Podtiaguin (1944) is consistent with taxonomic usage at the time.

Comments on usage of *Nyctinomus* (110–111): *Nyctinomus* É. Geoffroy St.-Hilaire, 1818a, is a genus of molossids defined as having a grooved upper lip. This was the generic name used by Thomas (1901c) and Foster (1905). On the basis of priority, Lyon (1914) replaced *Nyctinomus* with *Tadarida* Rafinesque, 1814, as the generic name broadly applied to molossids having a grooved upper lip. Today *Tadarida*, in the Western Hemisphere, is restricted to the Brazilian free-tailed bat *Tadarida brasiliensis* (I. Geoffroy St.-Hilaire, 1824a). *Nyctinomops* Miller, 1902, with type species *Nyctinomus femorosaccus* Merriam, 1889, was treated as a synonym of *Tadarida* until Freeman (1981) elevated *Nyctinomops* as the generic name for New World, groove-lipped molossids having large ears medially joined across the forehead. The outdated use of *Nyctinomus* by Bertoni, retained from Bertoni (1914a), provides further evidence that the primary source of his chiropteran nomenclature was Foster (1905), which was based on Thomas (1901c).

“110 *Nyctinomus brasiliensis* Geoff”.

“Puerto Bertoni; Asunción”.

ID = BRAZILIAN FREE-TAILED BAT *Tadarida brasiliensis* (I. Geoffroy St. Hilaire, 1824a)?

Tadarida Rafinesque, 1814: 55

Nyctinomus É. Geoffroy St.-Hilaire, 1818a: 114

Nyctinomus Brasiliensis I. Geoffroy St.-Hilaire, 1824a: 343

Nyctinomus brasiliensis (1914a)

Comments: Thomas (1901c) claimed that there was “no doubt” that *Tadarida brasiliensis* is the same species as the *Chauve-Souris Neuvieme ou Petite Chauve-Souris Obscure* of Azara (1801, 2: 288) and the *Murcielago Obscuro Menor* of Azara (1802, 2: 306). No locality is given in Azara (1801; 1802), but Azara (in Agacino, 1941) stated that the specimen he described was captured on a tree in the Capital during May. The restriction of type locality by Cabrera (1958) to Asunción is based on information in Agacino (1941).

From Azara's description of vertical grooves on the upper lip, the *Chauve-Souris Neuvieme* can only be a *Tadarida* or a *Nyctinomops* Miller, 1902, among Paraguayan bats. However, measurements fail to distinguish between *T. brasiliensis* and *Nyctinomops laticaudatus* (É. Geoffroy St.-Hilaire, 1805) and there are no obvious differences between Azara's descriptions of the *Chauve-Souris Neuvieme* and the *Chauve-Souris Huitieme* (= *Nyctinomops laticaudatus*) beyond relatively insignificant differences in colour and size. Perhaps most importantly Azara (1801; 1802) described the tongue, fangs, teeth, and molars as like the previous species, missing the characteristic converging upper incisors of *Tadarida brasiliensis* and makes no mention of the abundant, thick vibrissae on the face (Díaz *et al.*, 2011). Furthermore, his statement that “The ear is very broad, rounded, very

long and touches the other at a distance two lines from the tip of the snout” conclusively rules out *Tadarida*, a genus in which the ears are separated by a small space. Bearing in mind that *T. brasiliensis* is a rare bat in Paraguay, and that *N. laticaudatus* is substantially more abundant (López-González, 2005), I consider it highly likely that the *Chauve-Souris Neuvieme* and *Chauve-Souris Huitieme* both refer to the species we know today as *Nyctinomops laticaudatus*.

Molossus Caecus Rengger, 1830: 88 was believed by Rengger to be the *Chauve-Souris Neuvieme* ou *Petite Chauve-Souris Obscure* of Azara, but Eger (2008) synonymized that name with *Nyctinomus laticaudatus* (E. Geoffroy St.-Hilaire, 1805).

The identity of Bertoni’s (1939) bat number 110 is unclear as he provided no information to support his identification. If he based his determination on either Azara or Rengger, two sources he was known to possess, then Bertoni’s identification is incorrect; therefore, I treat it as doubtful. His locality, Puerto Bertoni, is in Alto Paraná department, but López-González (2005) did not include that department in her Paraguayan distribution of *Tadarida brasiliensis*.

“111 *Nyctinomus laticaudatus* (Geoff.)”.

ID = GEOFFROY’S FREE-TAILED BAT *Nyctinomops laticaudatus* (É. Geoffroy St. Hilaire, 1805)

Molossus laticaudatus É. Geoffroy St.-Hilaire, 1805: 279

Nyctinomus É. Geoffroy St.-Hilaire, 1818a: 114

Nyctinomops Miller, 1902: 393

Nyctinomus laticaudatus (1914a)

Comments: Geoffroy’s *Molossus laticaudatus* is based on the *Chauve-Souris Huitieme* ou *Chauve-Souris Obscure* of Azara (180, 2: 286) and also is the *Murcielago Obscuro* of Azara (1802, 2: 305).

Azara (in Agacino, 1941) stated that his specimen was captured in the house of Dr. Ignacio Pazos.⁷ Cabrera’s (1958) restriction of the type locality to Asunción is reasonable based on the known distribution of the species (López-González, 2005).

Bertoni followed the nomenclature of Thomas (1901c) and Foster (1905) but did not include the locality “Sapucay” provided by Thomas (1901c). Podtiaguin (1944) referred to this species as *Tadarida laticaudata*, a name combination first used by Shamel (1931).

“112 *Vespertilio dorianus* Dobs”.

ID = COMMON BROWN BAT *Eptesicus furinalis* (d’Orbigny, 1847)

Vespertilio Schreber, 1774: pl. 53, (not Linnaeus, 1758: 31)

Eptesicus Rafinesque, 1820: 2

Vespertilio furinalis d’Orbigny & Gervais, 1847: 13

Vesperugo (*Vesperus*) *dorianus* Dobson, 1885: 17

Vespertilio dorianus (1914a)

Comments: Bertoni’s (1939) use of this *nomen dubium* is telling evidence that either Thomas (1901c) or Foster (1905), or both, were key resources. Difficult to explain is why

⁷ Pazos (La Coruña 1760 – Cádiz 3 October 1804) was a naval officer and geographer, and a member of an expedition to map the Spanish territories in South America. He worked closely with Azara during his time in Paraguay.

Bertoni (1939) included this species in his Emballonuridae, when Thomas (1901c) included it correctly in the Vespertilionidae; Foster (1905) did not use family-group names.

Vesperugo (Vesperus) dorianus Dobson, 1885, was long associated with the species now known as *Eptesicus diminutus* Osgood, 1915a: 197, until Williams (1978) demonstrated that measurements of Dobson's holotype ruled out *E. diminutus*. Assuming that Thomas (1901c) recognized the specimens as *Eptesicus*, the forearm measurements he provided (37 to 39 mm) suggest his specimens were *Eptesicus furinalis*, a common bat in Paraguay (López-González, 2005).

"113 *Histiotus velatus* (Geoff.)".

"Central Paraguay".

ID = TROPICAL LEAF-EARED BAT *Histiotus velatus* (I. Geoffroy St. Hilaire, 1824b)

Plecotus velatus I. Geoffroy St. Hilaire, 1824b: 446

Vespertilio J.B. Fischer, 1829: 118, (not Linnaeus, 1758: 31)

Histiotus P. Gervais, 1856: 77

Vespertilio velatus (1914a)

Comments: This is Azara's (1802, 2: 304) *Murcielago Orejón*, which he found at 30.5° (probably São Gabriel, Rio Grande do Sul, Brazil), and not in Paraguay. Foster (1905) listed this species without details, but it was not included by Thomas (1901c). Foster (1905) is probably the basis for Bertoni's locality "Paraguay Central", which he often used to refer generally to the area where Foster collected. The species is known only from Guairá department in Paraguay (López-González, 2005).

"114 *Cynops planirostris* (Peters.)".

"Paraguay River".

ID = WHITE-THROATED DOG-FACED BAT *Cynomops planirostris* (W.C.H. Peters, 1866)

M[olossus (Molossops)]. planirostris W.C.H. Peters, 1866: 575

Cynomops Thomas, 1920b: 189

Cynops A. de W. Bertoni, 1939: 13

Comments: *Cynomops* Thomas, 1920b, was clearly the intended name, but it was misspelled *Cynops* by Bertoni (1939). However, the use of this generic name is inconsistent with the rest of his taxonomic arrangement as the genotype of *Cynomops* is *Molossus cerastes* Thomas, 1901c, which Bertoni included in *Molossus* (undoubtedly following Foster (1905)).

Podtiaguin (1944) listed *Molossops planirostris paranus* (Thomas, 1901d), but questioned Bertoni's *Cynops planirostris* (Pet)? without elaborating further. This may have been over-caution by Podtiaguin resulting from Bertoni's (1939) spelling error, but nonetheless a clarification comment was warranted. *Cynomops paranus* (Thomas, 1901d) is now considered a valid species, but has not been found in Paraguay (López-González, 2005). In affording it subspecific status, Podtiaguin's *Molossops planirostris paranus* and Bertoni's *Cynops planirostris* are presumed to refer to the same species known today as *Cynomops planirostris*.

“Family Phyllostomidae”

Comments on Phyllostomidae (115–125): Bertoni’s greater familiarity with the Phyllostomidae in contrast to the other chiropteran families, is demonstrated by fewer errors and more information. Podtiaguin (1944) provided additional commentary on many of these species and included more details on their known distributions.

“115 *Artibeus planirostris* Spix”.

“Puerto Bertoni, Alto Paraná”.

ID = SPIX’S ARTIBEUS *Artibeus planirostris* (Spix, 1823)

Artibeus Leach, 1821b: 75

Phyllostoma planirostre Spix, 1823: 66

Artibeus planirostris (1914a)

“116 *Artibeus lituratus* (Licht.)”.

“Puerto Bertoni, Asunción. This “species” and *A. superiliatus* [sic] Wied (1826) seem to be just geographic forms of the variable *A. jamaicensis* (Leach.). In Puerto Bertoni they are very variable, tending to indicate that they are a single variable species”.

ID = GREAT ARTIBEUS *Artibeus lituratus* (Olfers, 1818)

Ph[yllostomus]. lituratus Olfers, 1818: 224

Artibeus Leach, 1821b: 75

Artibeus jamaicensis Leach, 1821b: 75

Phyll[ostoma]. superciliatum Schinz, 1821: 163

Artibeus lituratus (1914a)

Comments: *Phyllostomus lituratus* is based on the *Chauve–Souris Premiere ou Chauve–Souris Obscure et Rayée* of Azara (1801, 2: 269) and this is also the *Murcielago Obscuro Listado* of Azara (1802, 2: 291).

Lichtenstein (1823) used the *nomen nudum* *Phyllostomus lituratus* Illiger, 1815, which first became available in Olfers (1818). However, Olfers (1818) was long-overlooked (HersHKovitz, 1959a), which explains Bertoni’s (1939) listing of Lichtenstein as the author.

Bertoni’s (1939) reference to the variability of his specimens at Puerto Bertoni may have been because he had specimens of both *A. lituratus* and the very similar *A. fimbriatus* Gray, 1838: 487, both of which are abundant in forests of eastern Paraguay. *Artibeus fimbriatus* had been long confused with *A. lituratus* until Handley (1990) showed that it was a separate species.

“*Artibeus superciliatus* Wied” refers to *Phyllostoma superciliatus* Schinz, 1821, with type locality “Ostküste von Brasilien”; later restricted by Wied (1826) to Fazenda von Tapebucú, Rio de Janeiro State, Brazil. Schinz (1821) had attributed the name to Wied who collected the specimen. *Artibeus superciliatus* was the name used for Azara’s (1801) *Chauve–Souris Premiere* by Rengger (1830), perhaps explaining why Bertoni mentioned it.

“117 *Chrotopterus auritus* Pet”.

“Mbopí-guasú – A. Paraná; Pto. Bertoni”.

ID = WOOLLY FALSE VAMPIRE *Chrotopterus auritus* (W.C.H. Peters, 1856)

Vampyrus auritus W.C.H. Peters, 1856: 305

Chrotopterus W.C.H. Peters, 1865b: 505

Phyllostoma spectrum A. de W. Bertoni (1904a)

Chrotopterus auritus (1914a)

Comments: Bertoni's (1904a) mention of "a vampire" *Phyllostoma spectrum* (= *Vampyrum spectrum* [Linnaeus, 1758]) "feared by cattle" could be an example of where a young author, not being familiar with the Paraguayan fauna, did not use the correct name for the species. The claimed wingspan of 54 cm is too long for *Desmodus rotundus* (< 40 cm), smaller than about 80 cm for *Vampyrum spectrum* (Emmons, 1999), but similar to that of *Chrotopterus auritus* (A. Gardner pers. comm.). Thus, the reference to *Phyllostoma spectrum* Bertoni (1904a) seems likely to correspond to *Chrotopterus auritus*. The local name *Mbopí guasú* means big bat. See 118 *Desmodus rotundus*.

"118 *Desmodus rotundus* (Geoff.)".

"Mbopí-gusú. – Chaco".

ID = COMMON VAMPIRE BAT *Desmodus rotundus* (É. Geoffroy St.-Hilaire, 1810)

[*Vespertilio*] *spectrum* Linnaeus, 1758: 31

Phyllostoma G. Cuvier, 1800: Tab. 1

Phyllostoma rotundum É. Geoffroy St.-Hilaire, 1810: 181

Desmodus Wied-Neuwied, 1826: 231

Desmodus rotundus A. de W. Bertoni (1914a)

Comments: *Phyllostoma rotundum* is based on the *Chauve-Souris Troisième ou Chauve-Souris Brune* of Azara (1801, 2: 273) and also is the *Murcielago Mordedor* of Azara (1802, 2: 293). I have been unable to find the meaning of the local name provided *Mbopí gusú*. It is perhaps a mis-transcription of *Mbopí guasú* meaning big bat, which is also the common name which Bertoni (1939) applied to *C. auritus* (and perhaps stems from the confusion expressed in Bertoni 1904a).

"119 *Glossophaga soricina* Pall".

"Concepción".

ID = PALLAS'S LONG-TONGUED BAT *Glossophaga soricina* (Pallas, 1766)

Vespertilio soricinus Pallas, 1766: 48

Glossophaga É. Geoffroy St.-Hilaire, 1818b: 418

Glossophaga soricina (1914a)

Comments: This is another example of where Bertoni (1939) did not place the author's name in parentheses, consistent with Thomas (1901c) and Foster (1905).

"120 *Hemiderma perspicillatum* (L.)".

"Puerto Bertoni, Asunción".

ID = SEBA'S SHORT-TAILED BAT *Carollia perspicillata* (Linnaeus, 1758)

[*Vespertilio*] *perspicillatus* Linnaeus, 1758: 30

Carollia J.E. Gray, 1838: 488

Hemiderma P. Gervais, 1856: 43

Hemiderma perspicillatum (1914a)

Comments: In this instance Bertoni (1939) placed the author's name in parentheses, while Thomas (1901c) did not. On the other hand, Foster (1905) did not list the author of this taxon, providing more circumstantial evidence that Bertoni (1939) relied on Foster (1905) and did not have access to Thomas (1901c).

“**121** *Lonchoglossa? villosa* (Rengger.)”.
 “Concepción”.

ID = PALLAS'S LONG-TONGUED BAT *Glossophaga soricina* (Pallas, 1766)

Vespertilio soricinus Pallas, 1766: 48

Glossophaga É. Geoffroy St.-Hilaire, 1818b: 418

Glossophaga Villosa Rengger, 1830: 80

Lonchoglossa W.C.H. Peters, 1868: 364

Lonchoglossa: A. de W. Bertoni, 1914a: 78

Lonchoglossa? villosa (1914a)

Comments: Bertoni (1914, 1939) listed Rengger's (1830) species name, but used *Lonchoglossa* as the genus. It is unclear whether he also derived the locality from Rengger, who stated that he collected his specimens approximately below the third and twentieth parallel, which corresponds approximately to Bertoni's (1939) locality of Concepción. Note that Bertoni (1939) provided the same locality for *Lonchoglossa villosa* as for *Glossophaga soricina*, and that he cited this locality on only one other occasion, for *Noctilio leporinus* also as given in Rengger (1830). Concepción is not an area of the country that Bertoni frequented, however Podtiaguin (1944) mentioned bat specimens (now lost) collected in Concepción and housed in the Museo de Historia Natural del Paraguay. Perhaps these were the source of Bertoni's (1939) locality Concepción?

Rengger's (1830) description of *Glossophaga villosa* (based on six specimens) is detailed and identifiable as *G. soricina* Pallas, 1766. Griffiths & Gardner (2008) considered *G. villosa* Rengger, 1830, possibly based on a mixed species sample and unidentifiable because of a supernumerary molar, but supernumerary molars in *Glossophaga soricina* are not unknown (Ramírez-Pulido & Müdespacher, 1987). Rengger mentioned considerable dental variation in his sample, with some specimens missing teeth. The description is otherwise entirely consistent with *Glossophaga soricina*, a common bat in Paraguay (López-González, 2005).

Foster (1905) listed *Glossofaga* [sic] *soricina* and *Lonchoglossa? sp.*, and Bertoni may have attempted to associate the latter with Rengger's name. Podtiaguin (1944) listed *Lonchoglossa? [sic] villosa* of Bertoni (1914a, 1939) in the synonymy of *Lonchoglossa ecaudata* (Trouessart, 1897: 158), which equals *Anoura caudifer* (É. Geoffroy St.-Hilaire, 1818b), apparently deciding that Rengger's (1830) specimens were *Lonchoglossa ecaudata* despite a difference in total length of almost 20 mm. Podtiaguin (1944: 57) concluded that Rengger's description “could not be a species of *Glossophaga*, and must be *Lonchoglossa*, which according to my way of seeing it must be *L. ecaudata*”.

It seems that these four authors were at crossed purposes. *Lonchoglossa sp.* of Foster (1905) was likely *Anoura caudifer* (with dimensions of specimens from Concepción given in Podtiaguin 1944). Bertoni's (1914a, 1939) *Lonchoglossa villosa* may have been applied to the same specimens, but he confused the name with the species described by Rengger (1830) who was describing *Glossophaga soricina*. Podtiaguin (1944) may have assumed that Rengger was actually describing *Anoura caudifer*. As Bertoni (1939) referred only to Rengger, used the name authored by him, and provided a locality consistent with that text, it seems most parsimonious to consider his *Lonchoglossa villosa* a duplicate listing of *Glossophaga soricina*.

“122 *Pygoderma bilabiatum* Wagn”.

“Alto Paraná, Puerto Bertoni”.

ID = IPANEMA BAT *Pygoderma bilabiatum* (Wagner, 1843a)

Phyllostoma bilabiatum Wagner, 1843a: 366

Pygoderma W.C.H. Peters, 1863: 83

Pygoderma bilabiatum (1914a)

Comments: Bertoni, following Foster (1905), did not place Wagner in parentheses.

“123 *Sturnira exisum* Wagn”.

“Alto Paraná; Asunción”.

ID = LITTLE YELLOW-SHOULDERED BAT *Sturnira lilium* (É. Geoffroy St.-Hilaire, 1810)

Phyllostoma lilium É. Geoffroy St.-Hilaire, 1810: 181

Sturnira J.E. Gray, 1842: 257

Phyllostoma excisum Wagner, 1842: 358

Sturnira exisum A. de W. Bertoni, 1914a: 78

Sturnira exisum (1914a)

Comments: Neither Thomas (1901c) nor Foster (1905) listed *Sturnira exisum*, so its inclusion in Bertoni (1914a) presumably is based on specimens collected sometime between 1905 and “mid-1913”, the cut-off date for inclusion in that work.

Bertoni (1939) was correct to comment under the following species that both species of *Sturnira* probably are variants of the same species. *Phyllostoma excisum* is considered a junior synonym of *S. lilium*.

“124 *Sturnira lilium* (Geoff.)”.

“Paraguay Central; Asunción. The last two species are probably just local variations”.

ID = LITTLE YELLOW-SHOULDERED BAT *Sturnira lilium* (É. Geoffroy St.-Hilaire, 1810)

Phyllostoma lilium É. Geoffroy St.-Hilaire, 1810: 181

Sturnira J.E. Gray, 1842: 257

Sturnira lilium (1914a)

Comments: *Phyllostoma lilium* is based on the *Chauve-Souris Quatrieme ou Chauve-Souris Brun-Rougeatre* of Azara (1801, 2: 277), which also is the *Murcielago Pardo Roxizo* of Azara (1802, 2: 299). The specimen in the MNHN Paris cited by Rode (1941) and Carter & Dolan (1978) is not the holotype of this species (Gardner, 2008b), as Geoffroy-St-Hilaire (1818b: 416) made clear, he did not examine Azara’s specimens.

“125 *Vampyrops lineatus* Geoff”.

ID = WHITE-LINED BROAD-NOSED BAT *Platyrrhinus lineatus* (É. Geoffroy St.-Hilaire, 1810)

Phyllostoma lineatum É. Geoffroy St.-Hilaire, 1810: 180

Platyrrhinus Saussure, 1860: 429

Vampyrops W.C.H. Peters, 1865a: 257

Vampyrops lineatus (1914a)

Comments: *Phyllostoma lineatum* is based on the *Chauve-Souris Second ou Chauve-Souris Brune et Rayée* of Azara (1801, 2: 271) and this is also the *Murcielago Pardo Listado* of Azara

(1802, 2: 292). Rode (1941) and Carter & Dolan (1978) mistakenly reported that the holotype is in the Museum Nationale d'Histoire Naturelle, Paris (MNHN 953) (Gardner, 2008a). Azara's specimens were sent to Madrid and most, including the holotype of this species, were lost. The name is based entirely on the written description.

Azara (in Agacino, 1941) stated that two identical specimens were captured in his house, and though it is unclear geographically exactly which house he was referring to, the restriction by Cabrera (1958) to Asunción is reasonable based on the known distribution of the species and the fact that this is a common Paraguayan bat (López-González, 2005).

Vampyrops Peters, 1865a was used for this species for much of the 20th Century on the assumption that *Platyrrhinus* Saussure, 1860 was preoccupied by *Platyrrhinus* Schellenberg, 1798 (Insecta, Coleoptera). The availability of *Platyrrhinus* was demonstrated by Gardner & Ferrell (1990).

"Order VII PRIMATES"

"Family Cebidae" ⁸

"126 *Alouata nigra* E. Geoff".

"Karayá, Poû, Guari".

ID = BLACK-AND-GOLD HOWLER MONKEY *Alouatta caraya* (Humboldt, 1812) (Figure 11)

Alouatta Lacépède, 1799: 148

Simia Caraya Humboldt, 1812: 355

Stentor niger É. Geoffroy St.-Hilaire, 1812: 108

Alouata Trouessart, 1897: 32

[*Alouata*] *nigra* Trouessart, 1897: 35

Alouata nigra (1914a)

Comments: This is the *Carayá* of Azara (1802, 2: 169) and *le Caraya* of Azara (1801, 2: 208), the name meaning chief of the forest (Smith *et al.*, 2021). Rylands & Brandon-Jones (1998) pointed out that *Alouatta caraya* (Humboldt, 1812) has date priority over *Alouatta caraya* É. Geoffroy St.-Hilaire, 1812) even though both descriptions were published in 1812.

Bertoni's misspelling of *Alouatta* Lacépède, 1799, and the name combination *Alouata nigra* is identical to Trouessart's (1897) usage, which also was used by J.A. Allen (1900b). In fact, É. Geoffroy St.-Hilaire (1812) described the male and female separately as *Stentor niger* (based on Azara) and *Stentor stramineus*, respectively (Rylands & Brandon-Jones, 1998), giving Paraguay as the type locality of the former, and Para (presumably the city of Belém, Pará state, Brazil) as the type locality of the latter.

Alouata nigra sensu J.A. Allen (1900b) refers to a different species because the collection locality Juliaca is in southeastern Peru, where this species does not occur.

Comments on *Sapajus* (127–129): The "robust capuchin" genus *Sapajus* Kerr, 1792, was long considered to be part of the genus *Cebus* Erxleben, 1777, but they are now considered to belong to two distinct, monophyletic clades (Lynch Alfaro *et al.*, 2012; Martins Junior *et al.*, 2018), though some authors dispute that conclusion (Ruíz-García *et al.*, 2016a).

⁸ Each of the five Paraguayan species of primates are now considered to belong to separate families, and the families for the species listed by Bertoni are as follows: *Alouatta* (Atelidae), *Sapajus* (Cebidae), *Aotus* (Aotidae) and *Plecturocebus* (Pitheciidae) (Smith *et al.*, 2021).



Figure 11. Black-and-gold Howler Monkey *Alouatta caraya*, Estación Tres Gigantes, Alto Paraguay department. (Photo: Paul Smith).

Only the hooded capuchin *Sapajus cay* (Illiger, 1815) occurs in Paraguay, a member of the cryptic “*Cebus apella*” complex. The correct scientific name for Paraguayan *Sapajus* has been the subject of constant debate (Elliot, 1913; Cabrera, 1917, 1939, 1957; Hill, 1960; Torres, 1983; Mantecon *et al.*, 1984; Brown & Rumiz, 1985; Mudry, 1990; Zunino & Mudry, 1993; Ponsà *et al.*, 1995; Groves, 2001; Silva Junior, 2001; Martínez *et al.*, 2002, 2004; Ávila, 2004; Casado *et al.*, 2010; Rylands *et al.*, 2012; Aristide *et al.*, 2014), and descriptions of several species and subspecies have been based on specimens from Paraguay (Rengger, 1830; Pusch, 1941).

Bertoni’s (1939) recognition of two species (numbers 127 & 128, with number 129 listed as of hypothetical occurrence) is probably due to the assumption that Rengger’s (1830) *Cebus azarae* was a good taxon which he apparently distinguished by the number of tail vertebrae (stated as 22). However, it is not clear where Bertoni got this information because this character is not mentioned in Rengger’s description. The lack of a locality for Rengger’s species is evidence that Bertoni may not have been personally familiar with the species, as is the comment that the character is not of “*gran valor*” (“great value”), an indication of Bertoni’s confusion. The result was two listings of the same species.

“127 *Cebus fatuellus azarae* Rengger”.

“Kaaí”.

ID = HOODED CAPUCHIN *Sapajus cay* (Illiger, 1815)

[*Simia*] *Fatuellus* Linnaeus, 1766: 42

Cebus Erxleben, 1777: 44

Sapajus Kerr, 1792: 75

Callithrix Cay Illiger, 1815: 107

Cebus Azarae Rengger, 1830: 26

Cebus fatuellus (1914a)

Comments: This is the *Cay* of Azara (1802, 2: 182) and *le Cay* of Azara (1801, 2: 230), which means resident of the forests (Smith *et al.*, 2021). The nomenclatural history of this species is complex, and the name applied to Paraguayan populations has changed numerous times during the last century (Rylands *et al.*, 2005). The two names Bertoni (1914a, 1939) employed for this species (numbers 127 & 128) are synonyms, except for the name *Simia fatuellus* Linnaeus, 1776, which is now used for a subspecies of the western Amazonian large-headed capuchin *Sapajus macrocephalus* (Spix, 1823). Ruíz-García *et al.*, (2016b) considered both *fatuellus* and *macrocephalus* to be subspecies of brown capuchin *Cebus apella* (Linnaeus, 1758).

“128 *Cebus libidinosus* (Spix)”.

“The tail is longer than in *C. fatuellus* and with 23 free vertebrae, compared with 22 in the other species. Nonetheless variability is great and the character is not of great value. Kaaí – Alto Paraná”.

ID = HOODED CAPUCHIN *Sapajus cay* (Illiger, 1815)

Cebus Erxleben, 1777: 44

Sapajus Kerr, 1792: 75

Callithrix Cay Illiger, 1815: 107

Cebus libidinosus Spix, 1823: 5, Species 2, Tab. 2

Cebus libidinosus (1914a)

Comments: This is also the *Cay* of Azara (1802, 2: 182) and *le Cay* of Azara (1801, 2: 230) (Smith *et al.*, 2021).

“129 *Cebus vellerosus* I. Geoff”.

“Misiones, Argentina! – Kaaí hû. I identified a young pair from Cerro Imán, Argentina, as *C. cirrifer* Geoff., but specimens of adults from Iguazú compare well with the descriptions of *C. vellerosus*. The species exists from Santa Ana to Iguazú without crossing into Paraguay”.

ID = BLACK-TUFTED CAPUCHIN *Sapajus nigritus* (Goldfuss, 1809)

Cebus Erxleben, 1777: 44

Sapajus Kerr, 1792: 75

Cercopithecus nigritus Goldfuss, 1809: 74

Cebus cirrifer É. Geoffroy St.-Hilaire, 1812: 110

C[ebus]. vellerosus I. Geoffroy St.-Hilaire, 1851: 44

Cebus vellerosus A. de W. Bertoni, 1914a: 78

Cebus vellerosus (1914a)

Comments: The scientific names given by Bertoni (1914a, 1939) for this species are synonyms of the dark species *Sapajus nigritus* that occurs in Atlantic forests of Argentina and Brazil on the opposite bank of the Paraná River from Paraguay. Bertoni was correct that the species does not cross the river into Paraguay (Smith *et al.*, 2021). The common name, *Kaaí hû*, translates as black monkey or black resident of the forest.

“130 *Nyctipithecus azarae* (Humboldt.)”.

“Mirikiná. A live specimen that we had, as well as eating insects, ate the *Molossus* bats from the roof. It exists only in the watershed of the Paraguay River, it is not known in Alto Paraná, nor have I found it yet”.

ID = AZARA'S NIGHT MONKEY *Aotus azarae* (Humboldt, 1812)

Simia trivirgata Humboldt, 1811: 306

Aotus Humboldt, 1812: 358

Simia Azarae Humboldt, 1812: 359

Nyctipithecus Spix, 1823: 24

Nyctipithecus azarae (1914a)

Nyctipithecus trivirgatus (1904a; 1915)

Comments: This is the *Miriquiná* of Azara (1802, 2: 195) and *le Miriquouina* of Azara (1801, 2: 243). As Bertoni noted, the species apparently is absent from the Oriental region of Paraguay, occurring only in the Chaco west of the Paraguay River (Smith *et al.*, 2021).

The taxonomy of *Aotus* has changed considerably over the course of the last century, with descriptions of multiple species, which were then treated as subspecies of a single widespread species *A. trivirgatus* (Humboldt, 1811) until more recently, being recognized as good species again (Hershkovitz, 1983, Rowe & Jacobs, 2016). *Nyctipithecus* Spix, 1823, was used for the night monkeys, but was replaced by *Aotus*, which has priority.

“131 *Callithrix sciurea* (L.)”.

“Kaaí mirí. Paraguay, interior of the Chaco. A specimen was acquired from the indigenous people of the Paraguay River. It seems to be the same species as that which inhabits the yerba mate plantations of the northern interior of the country”.

ID = PALE-COATED TITI MONKEY *Plecturocebus pallescens* (Thomas, 1907)

[*Simia*] *sciurea* Linnaeus, 1758: 29

Callithrix Erxleben, 1777: XXXI, 55

Callithrix I. Geoffroy St.-Hilaire, 1812: 112

Callicebus pallescens Thomas, 1907: 161

Plecturocebus Byrne *et al.*, 2016: 13

Callithrix sciurea (1914a)

Comments: The specific name used by Bertoni (1914a, 1939) was a misidentification and associated with squirrel monkeys of the genus *Saimiri* Voigt, 1831: 95. The name combination Bertoni used was outdated even at the time he was writing (Smith *et al.*, 2021). No *Saimiri* have ever been documented for Paraguay. The closest squirrel monkey is *S. boliviensis* (I. Geoffroy St.-Hilaire and de Blainville, 1834), of eastern Bolivia well to the north of Paraguay (Wallace *et al.*, 2010).

The species intended by Bertoni is revealed by the common name *Kaaí mirí* (roughly translated as little monkey) and is the local Paraguayan name still in use today for *Plecturocebus pallescens* (Thomas, 1907), but is also, it should be noted, the root of the squirrel monkey generic name *Saimiri*. The omission of this species from both of Bertoni's *Catalogos* is surprising, as the type locality for *Callicebus pallescens* Thomas, 1907, is in Paraguay (30 miles north of Concepción) and the species, a common primate in the northern Chaco, was described prior to 1914. Further evidence that this is the species intended is that, in the 1800s, titis were included in the genus *Callithrix* É. Geoffroy Saint-Hilaire, 1812, before Thomas (1903c) showed that it was a junior homonym of *Callithrix* Erxleben, 1777. Bertoni may have been aware of another monkey species in Paraguay, but did not know its identity. Bertoni's statement “It seems to be the same species that inhabits the yerba mate plantations of the northern interior of the country” hints that his use of the name *Callithrix sciurea* was a guess.

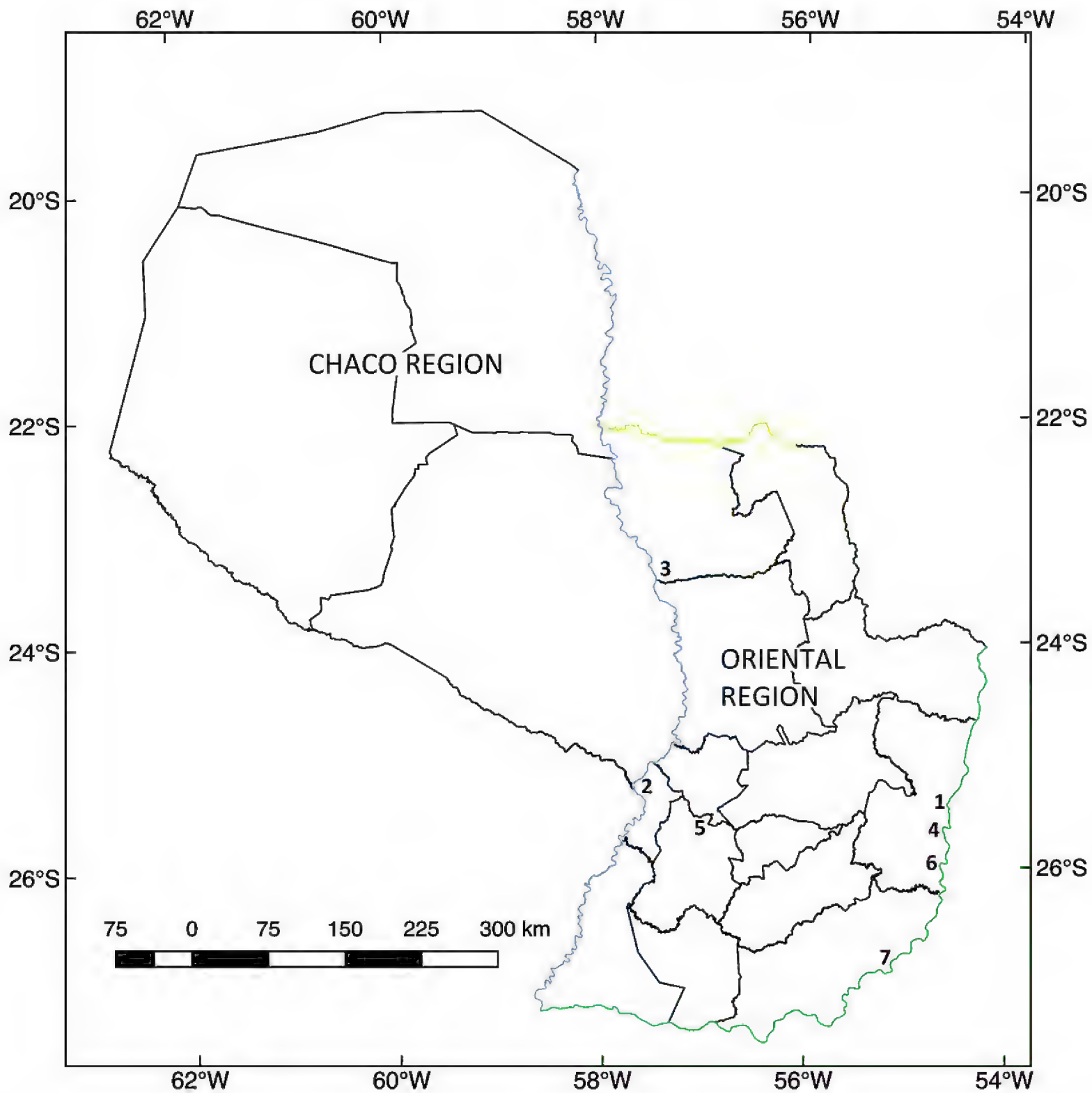


Figure 12. Map showing the gazetteer localities mentioned in Bertoni’s text. The country is split into two regions, the Chaco region west of the Paraguay River and the Oriental region east of the Paraguay River. Localities: 1) Alto Monday/Mondaíh; 2) Asunción (including Sma. Trinidad and Itá); 3) Concepción; 4) Puerto Bertoni; 5) Sapucái; 6) Villa Azara; 7) Yaguarasapá/Capitán Meza. Rivers: Rio Apá (yellow line); Rio Paraguay. (blue line); Rio Paraná. (green line); Arroyo Pirayu-í (see 7 Yaguarasapá/Capitán Meza).

GAZZETTEER OF LOCALITIES LISTED BY BERTONI

Bertoni makes a series of vague geographic references throughout his *Catálogos*, but provides relatively few precise localities. An attempt is made to explain the usage below, with coordinates provided where precise localities are given.

Alto Monday/Mondaíh (Alto Paraná department) – Referring to the area at the mouth of the Monday River and surrounding forests. The Monday River empties into the Upper Paraná River. 25° 33’ 40’’ S, 54° 38’ 00’’ W.

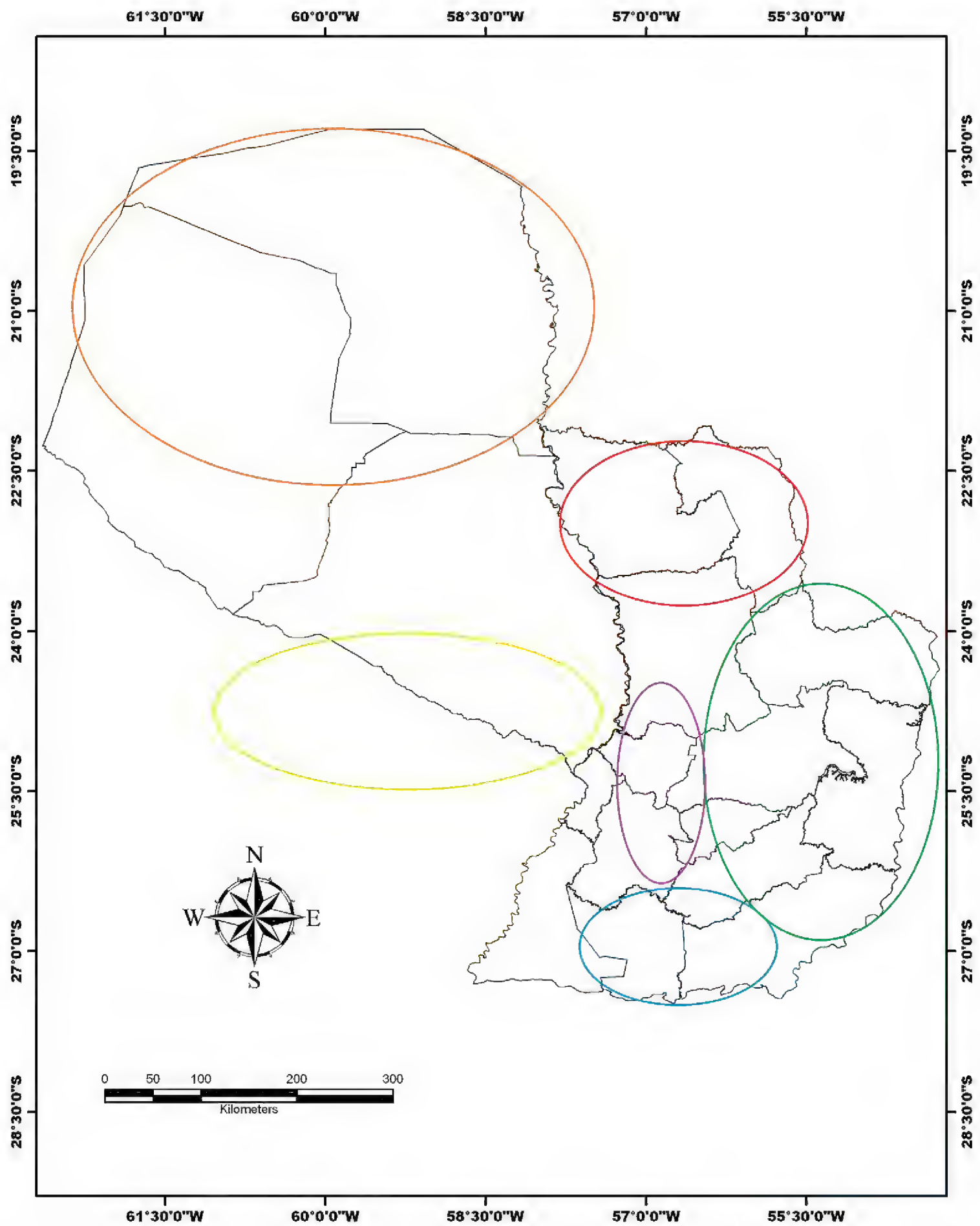


Figure 13. Map showing roughly the “eco-regions” referred to by Bertoni in his text: Alto Paraná (Green); Campos del Sur (Blue); Centro or Paraguay Central (Purple); Norte del Chaco (Orange); Pilcomayo (Yellow); “Yerbales del Norte”? (Red).

Alto Paraná – Although this is a modern-day political department in the eastern Oriental region, Bertoni’s usage refers to the historic region covered by the Atlantic Forest (Bosque Atlantico del Alto Paraná) which is today greatly fragmented, but which formerly extended

across Alto Paraná, Itapúa, Caazapá, Caaguazú, Canindeyú and Guairá departments, with marginal occurrence in Amambay and San Pedro departments.

Asunción – Capital city of Paraguay, where Bertoni resided for the majority of his life. 25° 18' S, 57° 38' W.

Campos del Sur. (Misiones and western Itapúa departments) – Refers to the Mesopotamian Grassland regions of southern Paraguay, in western Itapúa (largely to the west of the city of Encarnación) and Misiones departments.

Chaco (Alto Paraguay, Boquerón, and Presidente Hayes departments) – This is the region west of the Paraguay River.

Concepción (Concepción department) – A major port city located north of Asunción on the Paraguay River. 22° 24' 00" S, 57° 25' 48" W.

Itá (Central department) – A small satellite town of Asunción, today completely absorbed within the metropolitan area of the capital. 25° 29' S, 57° 21' W.

Pirá-yuí (= *Arroyo Pirayu-í*) (Itapúa department) – A small tributary of the Paraná River running close to the town of Capitán Meza.

Puerto Bertoni (= *Monumento Científico Moises Bertoni*) (Alto Paraná department) – Located on the banks of the Paraná River, the former Bertoni quinta is now a tourist attraction administered by the Fundación Moises Bertoni. A small number of Bertoni's specimens survive in poor condition, and remnants of his library have also been retained here. 25° 39' S, 54° 35' W.

Rio Apá (Concepción and Amambay departments) – The river forming the border between the Oriental region of Paraguay and Mato Grosso do Sul state in south-central Brazil.

Rio Paraguay – River running north to south which splits Paraguay into two regions, the Chaco to the west, and the Oriental region to the east.

Rio Paraná – River demarcating the eastern and southern borders of Paraguay, with Paraná state, Brazil and Corrientes and Misiones Provinces, Argentina. Bertoni's vague references to the Paraná may generally be understood to refer largely to the sections of the river in Alto Paraná and Itapúa departments, with which he was most familiar.

Sapucay (= *Sapucái*) (Paraguari department) – Small town that was the former administrative centre of the Paraguayan rail-road. The prolific collector Guillermo Foster was based here. Bertoni also regularly refers loosely to "Paraguay Central" in reference to Foster's specimens, which can be assumed to be in reference to the same general geographic area. 25° 40' 03" S, 54° 57' 20" W.

Sma. Trinidad (Asunción) – Refers to the Barrio in Asunción where the Jardín Botánico (former López estate) is located, and not the Jesuit ruins of La Santísima Trinidad del Paraná in Itapúa department. 25° 15' S, 57° 38' W.

Villa Azara (Alto Paraná department) – A now defunct settlement located about 15 km north of Nacunday National Park. 25° 54' S, 54° 43' W.

Yaguarasapá (= *Capitán Meza*) (Itapúa department) – A small town in southern Paraguay within the Atlantic Forest zone, and former residence of the Bertoni family. 27° 01' S, 55° 34' W.

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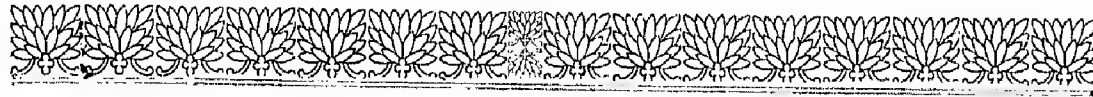
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APPENDIX. Facsimile pages 5–14 from *Revista de la Sociedad Científica del Paraguay* for 1939. Bertoni's Catálogos Sistemáticos de los Vertebrados del Paraguay.



CLASE PRIMERA

MAMÍFEROS

Después de las 2 obras fundamentales sobre los Mamíferos del Paraguay, *Azara y Rengger*, no ha aparecido sino breves listas basadas sobre algunas colecciones de Roedores y Quirópteros, especialmente de *Guillermo Föster*, de las cuales infelizmente se han perdido los ejemplares que dejara al Colegio Nacional. El total de las especies, señaladas para el país, que llegó a mi conocimiento, es de unas 85. Agregando las especies nuevas para la fauna que he descubierto y alguna que he comprobado definitivamente, la actual lista suma a 123 especies. Esto es, sin contar las dudas, y omitiendo otras por la duda. En una lista publicada por mí en la «*Prælia*» de 1901 enumeré 88 especies; mi artículo sobre los Mamíferos de 1904 (*El Agricultor*) versa sobre la biología y utilidad. Exploraciones posteriores aumentarán sin duda los roedores, especialmente por el N. del Chaco, ya puede preverse cuales pueden ser. Entre los objetos enviados al Museo de la Plata en 1893 hay algunos pequeños mamíferos, por si han sido mal rotulados como los reptiles, advierto que son todos procedentes de la orilla paraguaya del Rio Paraná. En mi visita de 1905 a dicho museo no he podido reconocerlos. Ya veremos que en todas las clases de vertebrados superiores hay especies que se resisten a franquear el río Paraná.

Este catálogo podrá ser útil, espero, no solo a la sistemática y zoogeografía, sino también para rectificar nombres erróneos que corren en colecciones particulares o escritos de personas ajenas a la sistemática en el país. Los nombres guaraní han sufrido menos cambios con la influencia europea.

6 REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY

ORD. I MARSUPIALES

Fam. Didelphidae

Son muy comunes donde no se les persigue. Sus principales enemigos son: el *Felis pardalis* para las mayores y el Gato doméstico para las menores. Estas últimas son sumamente útiles (1); las *Marmosas* son insectívoras, los *Peramys* dan caza a los Ratones.

- 1 *Chironectes minimus* (Zimm.) Guaraní: Ihapó. Yaguarasapá, Paraguay (II. 1888)! Se conocía solo del S. Brasil a Guatemala (Dr. M. S. Bertoni coll.) Yguasú (R. A.); Asunción; Puerto Bertoni.
- 2 *Didelphis paraguayensis* (Oken). Guar. Mbihkurê. Paraguay central y S. Misiones Bajas (R. A.), Sud Brasil. No remonta el Paraná, o sea la Zona de bosques.
- 3 *Didelphis marsupialis cancrivora* (Gm.) Mbihkurê, Mb. hù. Es la más común en los bosques del Alto Paraná, representada en todas las formas, menos *D. koseritzi* (Iher.). El caso más sensible es una hembra de Pto. Bertoni (8. X. 1896) con el color de la var. *typica*, que llevaba 12 hijos, 6 de cerdas blancas y 6 negros, demostrando así que el color solo no tiene valor sistemático. Las hay todo negras, pero siempre son marcadas las listas de la cara.
- 4 *Marmosa grisea* (Desm.)— Anguyá-guaikí. Pirá-yuí (X. 1887, Mus. de La Pl. Dr. Bertoni leg.), Paraguay central, San Ignacio.
- 5 *Marmosa pusilla* (Desm.)— Anguyá-guaikí. Puerto Bertoni Parag. central, Brasil. Común en la costa del Paraná la var. *agilis* (Burm.) leonada; la *tipica* es gris.
- 6 *Marmosa elegans* (Wath.); Asunción. El exmen del cráneo y de la gordura de la cola la refieren a esta especie del Sud. Anguyá-guaikí.
- 7 *Lutreolina crassicaudata* (Dem.)— Mbihkuré-pihtá. Arg., Par. S. Bras., Guyana, Asunción.
- 8 *Lutreolina nudicaudata* (Geoff.)— Guaikí. Puerto Bertoni Paraguay! Se conocía sólo de Costa Rica hasta el Brasil. Asunción (1921).
- 9 *Metachirops opossum* (L.), forma *quica* (Temmm.) Guaikí. Alto Paraná; Asunción. Común en todos los bosques del Alto Paraná. Color siempre gris.
- 10 *Peramys sorex* (Hensel),— Puerto Bertoni.
- 11 *Peramys dimidiatus* (Wagn.)— Puerto Bertoni. El color es más fuerte que en climas templados pero el esqueleto no deja duda de que se trata de esta especie.
- 12 *Peramys brevicaudatus* (Ersl.) — Mbihkurê-í.

(1) V. A. de W. Bertoni: «Mamíferos útiles y nocivos» en, «El Agricultor» N. 11 y 12 (Asunción 1904), y «Rev. Agronomía» tomo IV N. 3 y 4 (1910)

REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGNAY 7

Paraguay central, Pirayuí - Alto Paraná. A esta especie y congeneres las observé cazando ratas más grandes que ellas. El *P. dimidiatus* (Wagn.) de S. Brasil y Uruguay no es el «Colicorto» de Azara como piensa el Sr. Lahille. Tampoco es *P. dimidiatus* un ejemplar paraguayo (x.1833, Dr. Bertoni leg.) que existe en el Museo de La Plata. Pero comprobé su presencia en Pto. Bertoni.

13 *Peromys henseli* Thos.

Puerto Bertoni, Paraguay! Esta especie debe existir también en la margen argentina y del E. de Paraná. Un ejemplar fué identificado por el Dr. von Ihering (Ex. coll. Bertoni); Entre Rios (R. A.); Rio Gr. do Sud-Brasil.

14 *Philander lanigera* (Desm.)

Paraguay a S. México. En el Alto Paraná solo la señalé para el interior de Pto. Bertoni; Iguazú-R. Arg.

Ord. II DESDENTADOS

Fam. Bradypodidae

15 *Bradypus tridactylus* L. — Ao-aó.

San Pedro - Misiones Rep. Argentina. Chaco Weyenberg, in R. Napp: (Rep. Arg.); Oran.

En Misiones no llega ni cerca de la orilla del Paraná. La especie rodea al Paraguay casi completamente y he tenido noticias de ella en los yerbales del N.; pero necesita ser comprobada con ejemplares auténticos del territorio paraguayo, y aún puede ser otra especie la del norte.

Fam. Myrmecophagidae

16 *Myrmecophaga tridactyla* L. — Yurumí, Tamandú guasú.

Aunque raro, existe aún en todos los bosques del E. del Paraguay y Misiones Altas - Arg.

17 *Tamandua tetradactyla* (L.) - Kaguare.

Más frecuente que el anterior en el Paraguay y Misiones - Arg.; Puerto Bertoni-Parag.; Santa Ana-Mis. Arg.

Fam. Dasypodidae

18 *Euphractus sexcinctus gilvipes* (Ill.) — Tatú poyú, Tatú-vai. Alto Paraná.19 *Cabassous loricatus* Pelz. — Paraguay (Yepes).20 *Cabassous unicinctus* (L.) — Tatú-aí — Puerto Bertoni.21 *Prionodontes giganteus* Cuv. — Tatú-wasú, T. carreta.

Existe aún en la parte Norte del Paraguay. Mi amigo el Prof. Dr. Anisits ha tenido un ejemplar vivo. Entre otras particularidades observó que se paraba sobre las patas de atrás y caminaba lentamente a la manera de los Osos.

8 REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY

- 22 *Dasypus hybridus* (Desm.) — Tatú-mburicá.
 23 *Dasypus novemcinctus* (L.) — Tatú-hû (Par.), Tatú-eté (Bras).
 Es esta la especie que observé comiendo cadáveres. Puerto Bertoní, Asunción.
 24 *Tolypeustes matacos* (Desm.) — Chaco?

Ord. III UNGULADOS

Fam. *Tapiridae*

- 25 *Tapirus terrestris* (L.) — Tapií, Mboreví.
 Es todavía muy común en la región de bosques del Alto Paraná. De la Borde, naturalista y médico en la Guayana a fines del siglo XVIII, (quien a mi ver conoció mejor que sus contemporáneos a nuestro *Tapirus*) afirma que hay una variedad cenicienta. Esta creencia subsiste aún entre los cazadores de toda S. América. En el Paraguay le llaman tordillas a las grises; mas yo, que solo en el año 1897 he visto 22 ejemplares del Alto Monday, noté que la cara es siempre más o menos gris y que este color se extiende más o menos en los ejemplares viejos. La forma más gris que hallé era un ejemplar muy grande cuyo esqueleto remití al Museo de La Plata (nº 932. Yaguarasapá 1893). He podido comprobar la exactitud de la creencia de que los ejemplares de la costa del Paraná tienen un sabor fuerte, pero no guarda esto relación con el color y lo atribuyo a las aguas y a la edad o estado. Lo que es bien cierto que todas tienen crin y la extremidad de la oreja bordada de blanco. A los ejemplares más oscuros llaman Mboreví-hovíh. Se extiende por el Chaco.

Fam. *Tayassuidae*

- 26 *Tayassu pecari* Fisch. — Tañihca-tí.
 Jóvenes de la especie son todos los ejemplares que me dijeron los cazadores pertenecer a una dicha variedad "rubia". Los indios no reconocen tal variedad.
 27 *Pecari t. tajassu* (L.) — Taitetú.

Fam. *Cervidae*

- 28 *Odocoileus bezoarcticus* (L.) — Gwasú-tí.
 29 *Odocoileus paludosus* (Desm.) — Gwasú-pucú.
 30 *Mazama nana* (Lund) — Mbororó.
 Creo ser esta una especie enana que cacé en Puerto Bertoní.
 31 *Mazama simplicicornis* (Ill.) — Gwasú-virá.
 Es común en el Paraguay, pero no se interna en los grandes bosques del Alto Paraná. Asunción, Centro y Sud.

REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY 9

- 32 *Mazama rondoni* Mir. Rib. = *M. nemorivaga* (F. Cuv.)? — Río Paraguay, Jardín Zoológico.
Estos Cérvidos ofrecen a veces variaciones transitorias entre las especies aliadas, ocasionando confusiones.
- 33 *Mazama rufina* (Puch.) — Mbororó. — Alto Paraná, Paraguay!, Argentina!, Brasil. Común.
- 34 *Mazama americana* (Gm.) — Gwasú-pihtâ.
Común en todos los bosques del Este del Paraguay, Misiones Argentina y Paraná Brasil, hasta Asunción.

Ord. IV ROEDORES

Fam. *Sciuridae*

- 35 *Sciurus ingrami* Thos. = Wareruâ (Avá-chiripá del Monday).
Existe en Santa Ana e Iguazú - Misiones argentina, pero nunca lo hallé en la costa paraguaya. Sin embargo los guaraní del Alto Monday lo reconocieron y dicen existir dos especies en el Paraguay. Si esto es exacto, la segunda debe ser el *S. variabilis* Is. Geoff. del Brasil y Bolivia; más la exactitud exige que esto sea comprobado antes de enumerarla entre las especies paraguayas. Los Guayaná le llaman kua-tí-se-relepé. Mi ejemplar es gris.

Fam. *Muridae*

La sistemática y la distribución de las ratas silvestres en Sud América deja aún mucho que desear; la sinonimia tampoco está bien resuelta. Es, pues, de esperar que investigaciones posteriores aumentarán considerablemente la lista de nuestras especies, especialmente del lado del Chaco. Por no salir de la exactitud omito especies que nos rodean de muy cerca.

- 36 *Akodon arenicola* (Waterh.) — Paraguay.
- 37 *Akodon fuliginosus* (Wagn.) — Puerto Bertoni! San Pablo - Brasil. Común.
- 38 *Akodon obscurus* (Waterh.) — Paraguay, Argentina, Uruguay; Alto Paraná; Chaco (1932).
- 39 *Akodon subterraneus* (Hensel) — Puerto Bertoni!, Río Gr. do Sul. Común.
- 40 *Holochilus vulpinus* (Licht.) — Pto. Bertoni.
- 41 *Holochilus chacararius* Thos. — Centro.
- 42 *Mus musculus* L. — Ratón doméstico — Tiende a tomar color canela.
- 43 *Epimys decumanus maurus* (Waterh.) — Rata doméstica — Raras veces se observa en el país.
- 44 *Epimys rattus setosus* (Lund.) — Rata negra — Asunción.
- 45 *Epimys rattus norvegicus* (Erxl.) — Asunción; Alto Paraná.
- 46 *Nectomys squamipes* (Licht.) — Alto Paraná. Paraguay; Pto. Bertoni. Yavevihrih — Argentina.

10 REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY

- 47 *Oryzomys flarescens* Wath. -- Alto Paraná.
 48 *Oryzomys anguya* (Desm.) -- Anguyá pihitá. --- Asunción.
 49 *Oryzomys cephalotes* (Desm.)
 50 *Oryzomys longicaudatus* (Benn.) -- Yaguarasapá.
 51 *Oryzomys longitarsus* (Rengger.)
 52 *Oryzomys nigripes* (Desm.)
 53 *Oryzomys pyrrhorhinus* (Wied.) -- Sma. Trinidad.
 54 *Oecomycterus rufus* (Desm.) -- Pto. Bertoni.
 55 *Oecomycterus nasutus* Waterh. -- Yaguarasapá -- Anguyá pihitá (s. str.)
 Si es exacta mi determinación, creo el presente es cuando más una subespecie del *O. rufus*.
 56 *Phyllotis auritus* (Desm.) (1).
 57 *Reithrodon typicus* Wath. -- Misiones.

Fam. Octodontidae

- 58 *Ctenomys dorsalis*. Thos. -- Anguyá-ihvihgwi. -- Habita solo la región de campos del S. y Chaco.
 59 *Dactylopsomys amblyonyx* Wagn. -- Puerto Bertoni. Paraguay!
 60 *Echymys longicaudatus* Rengger -- Paraguay central.
 Variedad de *E. cayennensis* probablemente.
 61 *Lonchoceros cristatus* (E. Geoff.) -- Paraguay (Trouesart).
 62 *Mesomys spinosus* (E. Geoff.) -- Desm. Puerto Bertoni, Yaguarasapá, centro. Común.
 Debe existir también en la margen Argentina.
 63 *Myocastor coypus* (Mol.) Kihyá.
 64 *Trichomys fosteri* Thos -- Sapucay (2)

Fam. Hystricidae

- 65 *Coendu villosus* (F. Cuy.) -- Kui-i.
 Es muy escaso en la costa del Paraná. He obtenido ejemplares en Puerto Bertoni y Santa Ana - Argentina! Mi hermano Tell Bertoni mantuvo cautivo uno muchos meses y confirmó en todos los detalles las observaciones hechas por Azara.

Fam. Dasyproctidae

- 66 *Caelogenys paca* (L.) -- Pág, Akutí-páih.
 Existe todavía en todo el Alto Paraná. Paraná, Argentina, Paraguay.
 67 *Dasyprocta aguti azarae* (Licht.) -- Akutí.
 Muy común en todo el Paraguay y Misiones arg., E. de Paraná.
 En nuestra región conozco dos formas. Temo que más de una «especie» del norte debe bajar a la categoría de variedad.
 68 *Dasyprocta caudata* Lund. -- Puerto Bertoni.

- (1) Según Trouesart es sinónimo de esta especie el *Mus callosus* de Rengger, pero me permito abrigar alguna duda.
 (2) No hallé todavía *Trichomys* en el Paraguay, mas vi en la colección del Sr. Foster determinado con este nombre un ejemplar de Sapucay.

REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY 11

Fam. Caviidae

- 69 *Cavia porcellus aperea* Erxl. — Apereá — Yaguarasapá.
70 *Cavia porcellus leucopyga* Bradt. — Apereá — Pto. Bertoni.
71 *Cavia spixi* Wagl. — Apereá morotí — Villa Azara - Paraguay!
72 *Hydrochoerus hydrochoerus* (L.) — Kapiihvá.

Fam. Leporidae

- 73 *Lepus brasiliensis*. (Briss.) — Tapití.
74 *Lagostomus maximus* (Blainv.) — Viscacha, «Tapití boliviano».
Se extiende bastante por el Chaco Paraguayo. (Caballero coll.)

Ord. V CARNIVOROS**Fam. Felidae**

- 75 *Felis concolor* L. — Guasuára, Yaguá pihtá.
76 *Felis eyra*. Fisch. — Mbarakayá-eirá pihtá, Yaguarundih pihtá.
Un ejemplar, cazado en el agua a la altura del Ihguasú, demuestra que no es sino variedad del nº 77, representando la faz leonada que se observa también en la *Nasua*. Soy, pues, de la opinión de Winge. No es otra cosa que esta forma, tal como la describe Azara, el *F. ameghinoi* de Holmberg (II Censo R. A.)
77 *Felis yaguarundi* Fisch. — Mbarakayá eirá (S.), Akutí-yaguá (E), Yaguarundih (Centro).
No tan rara como la variedad leonada en Puerto Bertoni, Tacurú-pucú.
78 *Felis braccata* Cope. — Río Paraguay — Hoy considero melanismo de esta especie la diagnóstico siguiente: «*Felis melas* W. Bertoni (nec Perón.) — Mbarakayá-hú, Chivi-hú (Alto Mondaíh.) Magnitud del *F. tigrina*. Toda la espalda y lomo negro uniforme; los costados del cuerpo y piernas, la rabadilla y cola, color café o castaño con manchas ovales o bien redondas muy negras. Garganta y pecho castaño claro con manchas no tan negras como en los costados; abdomen castaño claro inmaculado. El ejemplar lo han traído del Alto Mondaíh, preparado y me lo prestaron para hacer la descripción. Creí por mucho tiempo que se tratase de melanismo; pero hoy que conozco la forma negra de las otras especies he cambiado de opinión. En todo caso se trataría de una curiosa forma incompleta del melanismo que no he visto descrita para S. América. En las otras especies el melanismo es total con el fondo menos intenso que permite ver el diseño de la especie. El ejemplar en cuestión no tiene diseño en la espalda».
79 *Panthera onca paraguayensis* Allen. — Yaguá-pará, Yaguareté, Yavukú (E); Yaguá pini (Bras.)

12 REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY

- Sólo dos casos de *melanismo* observé en el Paraguay.
- 80 *Felis pardalis* L. — Chiví-guasú, Yaguareté-i, Yaguá-tirí (Bras.)
Muy variable; las principales formas de color que he hallado corresponden a la *typica* y *griseus*.
- 81 *Felis tigrina* Erxl. — Chiví, Mbaracayá — Puerto Bertoni - Paraguay!
- 82 *Felis wiedi* Schinz — Chiví, Mbaracayá — Puerto Bertoni!, Ihguazú - Argentina.
El número de las vértebras caudales es considerablemente mayor que en las otras especies. Tiene melanismo como las dos anteriores.
- 83 *Felis geoffroyi* Orb. — Chaco, — común.

Fam. Canidae

- 84 *Cerdoción thous entrerianus* Burm. forma *melampus* Wagn. - Aguará-chai, Puerto Bertoni; Mondaíh.
- 85 *Chrysocyon brachyurus* (Ill.) — Aguará-guasú; — Mondaíh.
- 86 *Pseudalopex g. gymnocercus* Osgood. — Asunción.

Fam. Procyonidae

- 87 *Nasua narica* (L.) — Kuatí (1), Kuatí-mondé.
- 88 *Procyon cancrivorus brasiliensis* Iher. — Aguará-popé. — Puerto Bertoni, Asunción.

Fam. Mustelidae

- 89 *Conepatus chilensis* (Ill.) — Chaco — Yagua-né. (2)
He tenido noticias de *Conepatus*, pero requiere comprobación, en el Este y Sud.
- 90 *Tayra barbara* (L.) — Eirá. (Tayrá Oken) — A. Paraná.
- 91 *Grisson allamandi* (Bell.) — Yaguapé. — Puerto Bertoni; Itá.
- 92 *Grissonella huronax* Thos. — Yaguá kambé, Yaguapé — P. Bertoni.
- 93 *Speothos (Icticyon) venaticus* Lund. — Río Apá, (F. Amarilla); Chaco (Jardín Zoológico).
- 94 *Lutra paranensis* Rengger. — Río Paraguay, Paraná, Mondaíh.
- 95 *Pteronura brasiliensis* (Zimm.) — Arirái (Mondaíh); Río Paraná; Guairacá — Chaco y O. Brasil.

Ord. VI QUIROPTEROS**Fam. Vespertilionidae**

- 96 *Dasypterus ega* Gerv. — Pto. Bertoni.
- 97 *Atalapha borealis* (Müller.) — Asunción.
- 98 *Atalapha cinerea* (Pal. de Beauv.) — Asunción.

- (1) El Dr. von Ihering considera sinónimo de esta especie la *N. solitaria* de Wied, o sea el Kuatí mondé o Kuatí hañó; se trata nada más que de ejemplares viejos que se apartan de las bandadas. Efectivamente, yo tampoco hallé adultos entre los sociales.
- (2) El ejemplar vivo examinado viste los colores de la forma *maipurito*.

REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGNAY 13

- 99 *Myotis albescens* Geoff. — A. Paraná.
 100 *Myotis isidori* Gerv. — Corrientes, Paraguay?
 101 *Myotis nigricans* (Wied.) — A. Paraná, Asunción.
 102 *Myotis ruber* Geoff. — Asunción.

Fam. Emballonuridae

- 103 *Molossops bonariensis* (Peters.)
 104 *Molossus cerastes* Thos. — Chaco.
 105 *Molossus fosteri* Thos. — Chaco.
 106 *Molossus obscurus crassicaudatus* Geoff.
 107 *Molossus rufus* Geoff. Asunción.
 108 *Molossus temminki* (Lund.)
 109 *Noctilio leporinus* (L.) — Concepción.
 110 *Nyctinomus brasiliensis* Geoff — Pto. Bertoni; Asunción.
 111 *Nyctinomus laticaudatus* (Geoff.)
 112 *Vespertilio dorianus* Dobs.
 113 *Histiotus velatus* (Geoff.) — Paraguay Central.
 114 *Cynops planirostris* (Peters.) — Río Paraguay.

Fam. Phyllostomidae

- 115 *Artibeus planirostris* Spix — Pto. Bertoni, Alto Paraná.
 116 *Artibeus lituratus* (Licht.) — Puerto Bertoni, Asunción.
 Esta "especie" y el *A. superciliatus* de Wied. parecen ser sólo formas geográficas del variable *A. jamaicensis* (Leach.)
 En Pto. Bertoni son bastante variables, tienden a demostrar que se trata de una especie única y variable.
 117 *Chrotopterus acutus* Pet. — Mbopí-guasú — A. Paraná; Pto. Bertoni.
 118 *Desmodus rotundus* (Geoff.) — Mbopí-gusú. — Chaco.
 119 *Glossophaga soricina* Pall. — Concepción.
 120 *Hemiderma perspicillatum* (L.) — Pto. Bertoni, Asunción.
 121 *Lonchoglossa? villosa* (Rengger.) — Concepción.
 122 *Pygoderma bilabiatum* Wagn. — Alto Paraná, Pto. Bertoni.
 123 *Sturnira exisum* Wagn. — Alto Paraná; Asunción.
 124 *Sturnira lilium* (Geoff.) — Paraguay Central; Asunción.
 Las dos últimas probablemente son sólo variedades locales.
 125 *Vampyrops lineatus* Geoff.

Ord. VII PRIMATES**Fam. Cebidae**

- 126 *Alouata nigra* E. Geoff. — Karayá, Poú, Guará.
 127 *Cebus fatuellus azarae* Rengger — Kaai.
 128 *Cebus libidinosus* (Spix) — Kaai — Alto Paraná.
 La cola es más larga que en el *C. fatuellus* y con 23 vértebras libres, contra 22 de la otra especie; no obstante la variabilidad es grande y tal carácter no es de gran valor.

14 REVISTA DE LA SOCIEDAD CIENTIFICA DEL PARAGUAY

- 129 *Cebus vellerosus* I. Geoff. — Misiones, Argentina! — Kaaí-hû.
Determiné una pareja joven del Cerro Imán como *C. cirrifer* Geoff., pero ejemplares adultos del Iguasú vienen bien con las descripciones de *C. vellerosus*. La especie existe de Santa Ana al Iguasú, sin pasar al Paraguay.
- 130 *Nyctipithecus azarae* (Humboldt.) — Mirikiná.
Un ejemplar que hemos tenido vivo, además de insectos, comía los *Molossus* del tejado. Existe sólo en la cuenca del Río Paraguay, en el Alto Paraná ni le conocen ni lo he hallado todavía.
- 131 *Callithrix sciurea* (L.) — Kaaí-mirí—Paraguay, interior del Chaco.
Un ejemplar fué adquirido de los indios del río Paraguay. Parece la misma especie que habita los yerbales del interior norte del país.

